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| 5. AUTHOR(S) (First name, middle initial, last name) Dr. P. L. Ward and George Hade | | | |
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13. ABSTRACT

Five high-gain, broad-band, long period seismograph stations are being installed around the world. The instruments will probably have gains on the order of 100,000 or more at periods of 40 to 50 sec. This high sensitivity, some 50 to 100 times greater than previously attainable at these periods, should lead to a similar increase in the data now available in the long-period band. The purpose of this report is to describe the instruments, present a preliminary parts list, and present technical drawings of most of the newly designed components. The five sites are also briefly described. This report is written at a time when construction has begun at four sites.

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Program Code Number: 0F10
Contractor: Columbia University
Effective date of contract: 1 February 1970
Contract expiration date: 31 January 1971
Amount of contract: \$942,573.00
Contract Number: F44620-70-C-0038
Principal Investigator: Lynn R. Sykes, 914-359-2900
Project scientist: William Best, 202-0X4-5456
Title of work: Long-period Seismological Research Program

ABSTRACT

Five high-gain, broad-band, long-period seismograph stations are being installed around the world. The instruments will probably have gains on the order of 100,000 or more at periods of 40 to 50 sec. This high sensitivity, some 50 to 100 times greater than previously attainable at these periods, should lead to a similar increase in the data now available in the long-period band. The purpose of this report is to describe the instruments, present a preliminary parts list, and present technical drawings of most of the newly designed components. The five sites are also briefly described. This report is written at a time when construction has begun at four sites.

GENERAL DESCRIPTION OF THE INSTRUMENTS

The design of these instruments is based on that developed by Pomeroy and Hade (Pomeroy et al., 1969) in the Ogdensburg Mine in New Jersey. Both vertical and horizontal components have been operating successfully for nearly two years at Ogdensburg. A block diagram of the system is shown in Figure 1. The heart of the system is a Geotech seismometer with a natural frequency of 30 sec. This is coupled to a Kinematics galvanometer with a natural frequency of 100 sec. The signal from the galvanometer is amplified by a phototube amplifier and recorded digitally and photographically. Both high and low gain photographic records are available. The dynamic range of the digital recordings is over 70 db and is limited by the phototube amplifiers.

The high sensitivity of these instruments is achieved by electronically filtering out 0 second microseisms and by isolating

the seismometer from changes in barometric pressure. The isolation is achieved primarily by a hemispherical tank shown in Figure 2. This new design features a hemispherical top, shallow walls, and a metal to metal contact of top and base. Experiments at Ogdensburg show that tanks of this new design, unlike those used by Pomeroy and others, will perform nearly all of the necessary filtering of barometric changes. For added security, however, these tanks will be placed in an air-tight cement or stone vault with a bulkhead door.

High sensitivity is also achieved because the instrument passband has been shaped to correlate with a natural low in earth noise. This is shown by a plot of spectral amplitude density of noise during June, 1969 (Figure 3) together with a plot of the response of the vertical instrument (Savino, personal communication, 1970).

The background noise observed on the test instruments at Ogdensburg appears to be true ground motion and not instrumental noise. This is most directly shown by the following experiment carried out by Savino and Hade: two different types of seismometers were operated in two different parts of the Ogdensburg mine (Figure 4). A Sprengnether seismometer was placed in a chamber in the mine separated from the main tunnel by two bulkhead doors. A Geotecn seismometer in a pressure tank was operated behind three good bulkhead doors about 500 feet from the Sprengnether instrument. The signals were recorded simultaneously on digital magnetic tape. A coherence between the two signals

was calculated digitally for a period of recording of 5 hours, 14 minutes. As can be seen in Figure 5, the coherence squared is exceptionally good and well above the 95% confidence limits in the passband of interest. This is one of the experiments that has convinced us that instrument noise does not contribute significantly to the observed seismic background.

Data will consist of 6 photographic records per day (3 components of high and low gain) on 70 mm microfilm distributed by the USCGS through the same channels as the WWCSSN data. One digital tape will be filled every two weeks. The tapes will be combined by Texas Instruments into master tapes containing all stations. The digital tapes consist of header time data, outputs of the three velocity transducers digitized at a rate of one sample per second, and outputs of three displacement transducers digitized at rates of one sample per five seconds. The general theory of operation and tape format of the digital system are described in Appendix 1.

DETAILED DESCRIPTION OF THE INSTRUMENTS

Appendix 2 contains detailed drawings and a preliminary parts list of the system. The drawings and parts list are arranged by four digit part numbers. The first digit (thousands digit), signifies the location or overall classification of the part according to the following scheme:

- 1 Seismometer room
- 2 Preamplifier room
- 3 Control room
- 4 Photographic room
- 5 Pressure door assembly
- 6 Expendable supplies, general
- 7 Expendable supplies, used for installation
- 8 Special tools needed for installation

The parts list consists of major assemblies as purchased or built by or for Lamont. When an "X" appears in the column labeled "Detailed Drawing", a drawing is included and arranged in order of part number. These drawings contain subassembly parts lists. An "M" in the same column signifies that a manufacturer's instruction manual is available.

SUMMARY OF NEW STATION SITES

Station: Fairbanks, Alaska

Location Latitude 64.37°N
Longitude 148.07°W
Elevation About 305 meters

Principal contact: John B. Townshend
Chief, College Observatory
Coast and Geodetic Survey
College, Alaska 99701
907-479-7626

Station type: Old Clipper Gold Mine with 130 meters
overburden.

Owned by: Mr. Lloyd Loundsbury
Fairbanks, Alaska
907-456-5975
About 11.5 km southwest of WWSSN station.

Station: Charters Towers, Australia

Location: Latitude 20.09S
 Longitude 146.25E
 Elevation 357 meters

Principal contact:

Dr. John P. Webb
 Dept. of Geology and Mineralogy
 University of Queensland
 St. Lucia, Queensland, 4067
 Australia

Station type: Mine, 33 meters overburden.
 Next to WWSSN station

Station: Eilat, Israel

Location: Latitude 29.6°N
 Longitude 34.9°E
 Elevation --

Principal contact:

Prof. C.L. Pekeris
 Head of the Dept. of
 Applied Mathematics
 The Weizmann Institute of Science
 Rehovot, Israel

Station type: Mine

Station: Toledo, Spain

Location: Latitude 39.87N

Longitude 4.05W

Elevation --

Principal contact:

Dr. Gonzalo Payo

Instituto Geografico y Catastral

Observatorio Central Geofisico

Apartado 46

Toledo, Spain

Station type: Shallow tunnel in granite proposed.

Station: Chengmai, Thailand

Location: Latitude 18.79N

Longitude 98.98E

Elevation 416 meters

Principal contact:

Adm. San't Vesa-rajananda

Meteorological Dept.

Office of the Prime Minister

Bangkapi, Bangkok 11

Thailand

Station type: Open quarry, no overburden, next to WWSSN
station.

REFERENCES

Pomeroy, P.W., G. Hade, J. Savino, and R. Chander, Preliminary results from high-gain, wide-band, long-period electromagnetic seismograph systems, J. Geophys. Res., 74 (12), 3295, 1969.

FIGURE CAPTIONS

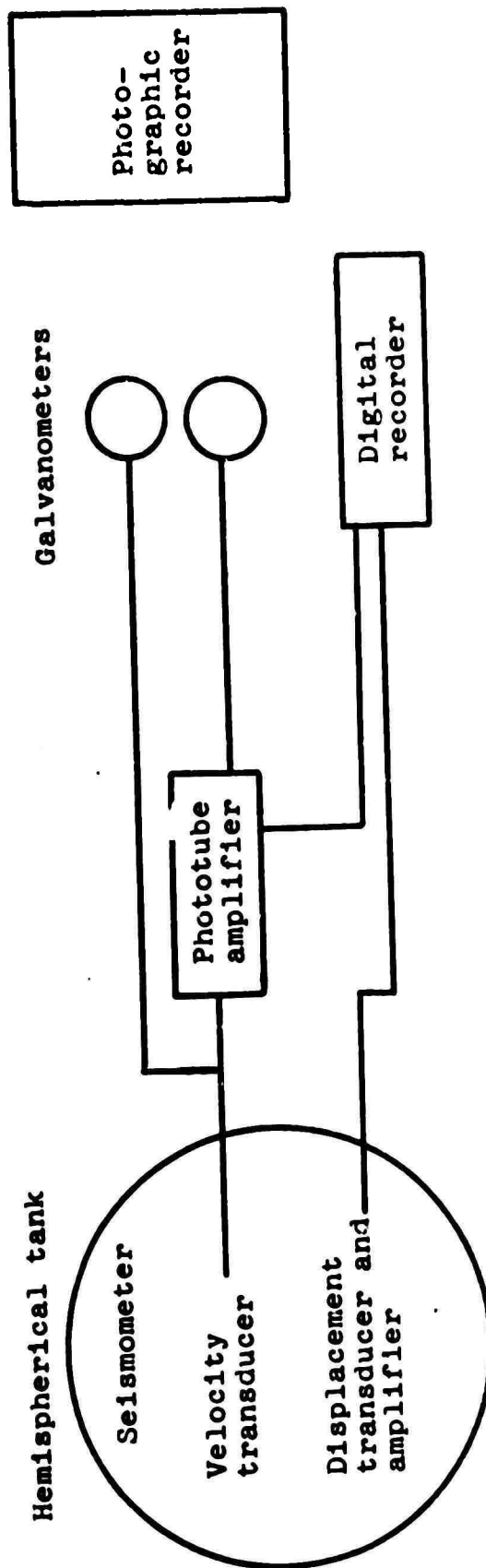
Figure 1. Block diagram of high-gain, long-period, broadband seismic system.

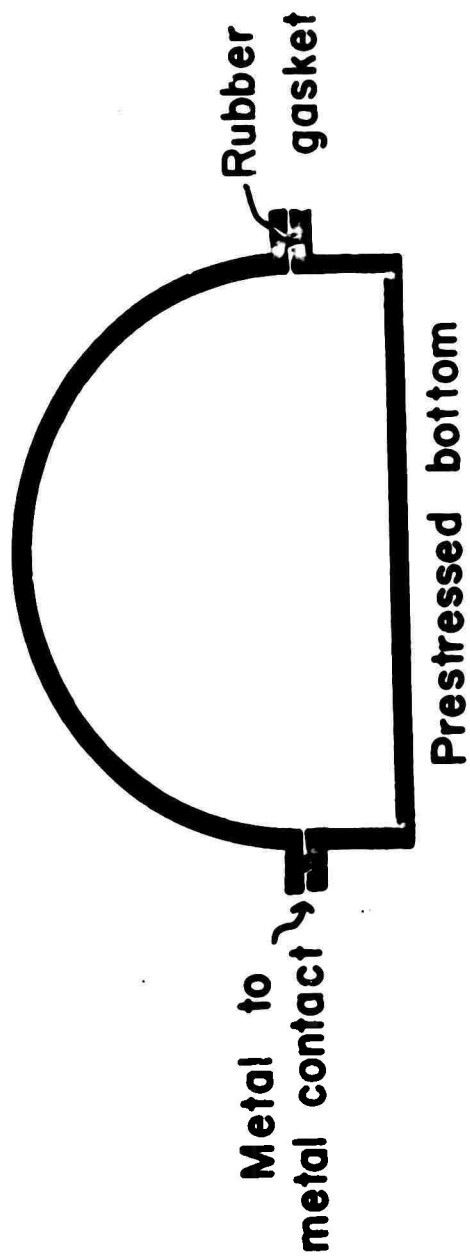
Figure 2. Schematic diagram of the pressure tank.

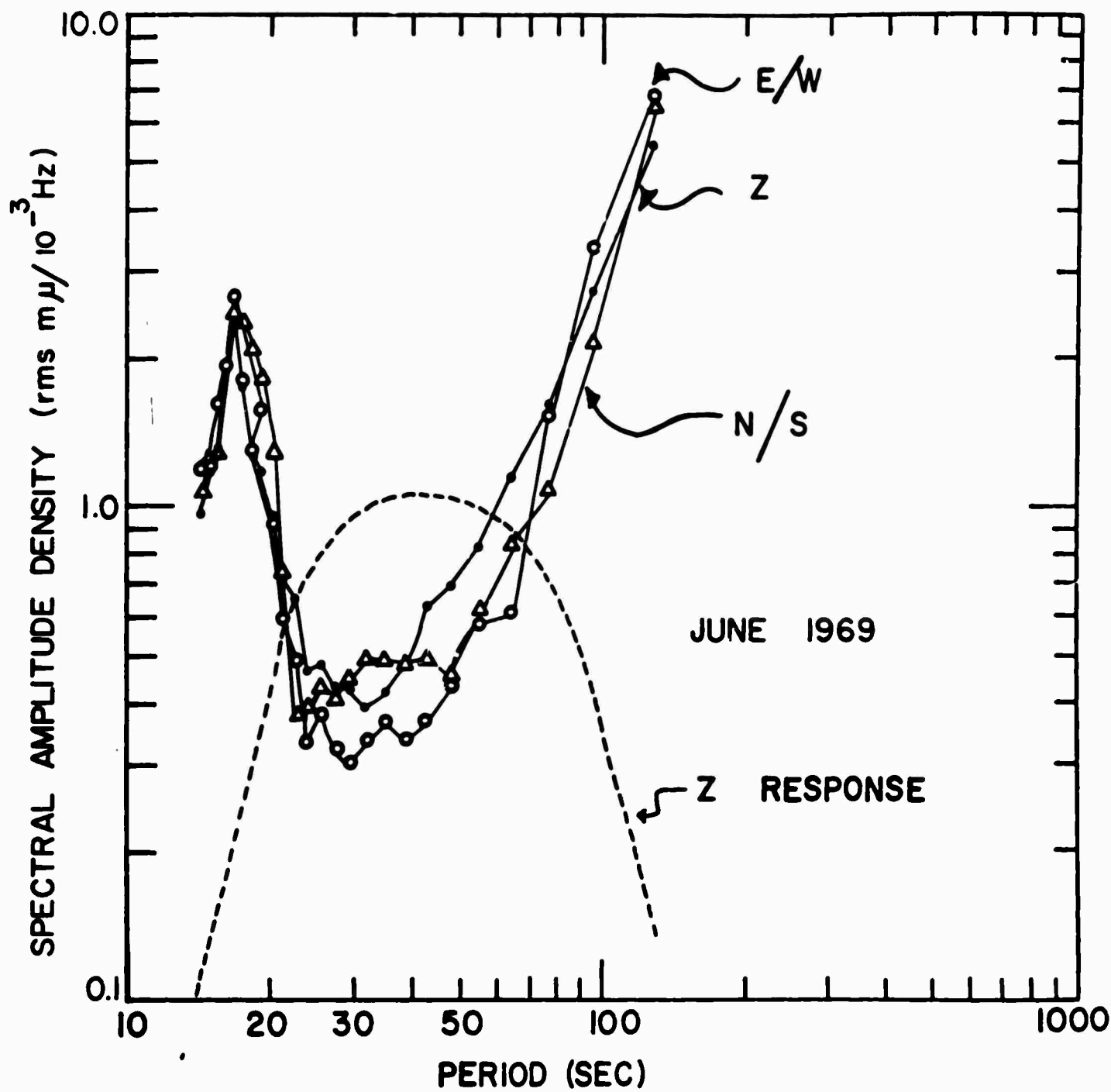
Figure 3. Spectral density of the noise on the Ogdensburg high-gain instruments during June, 1960. The response of the vertical instrument is shown by the dashed line.

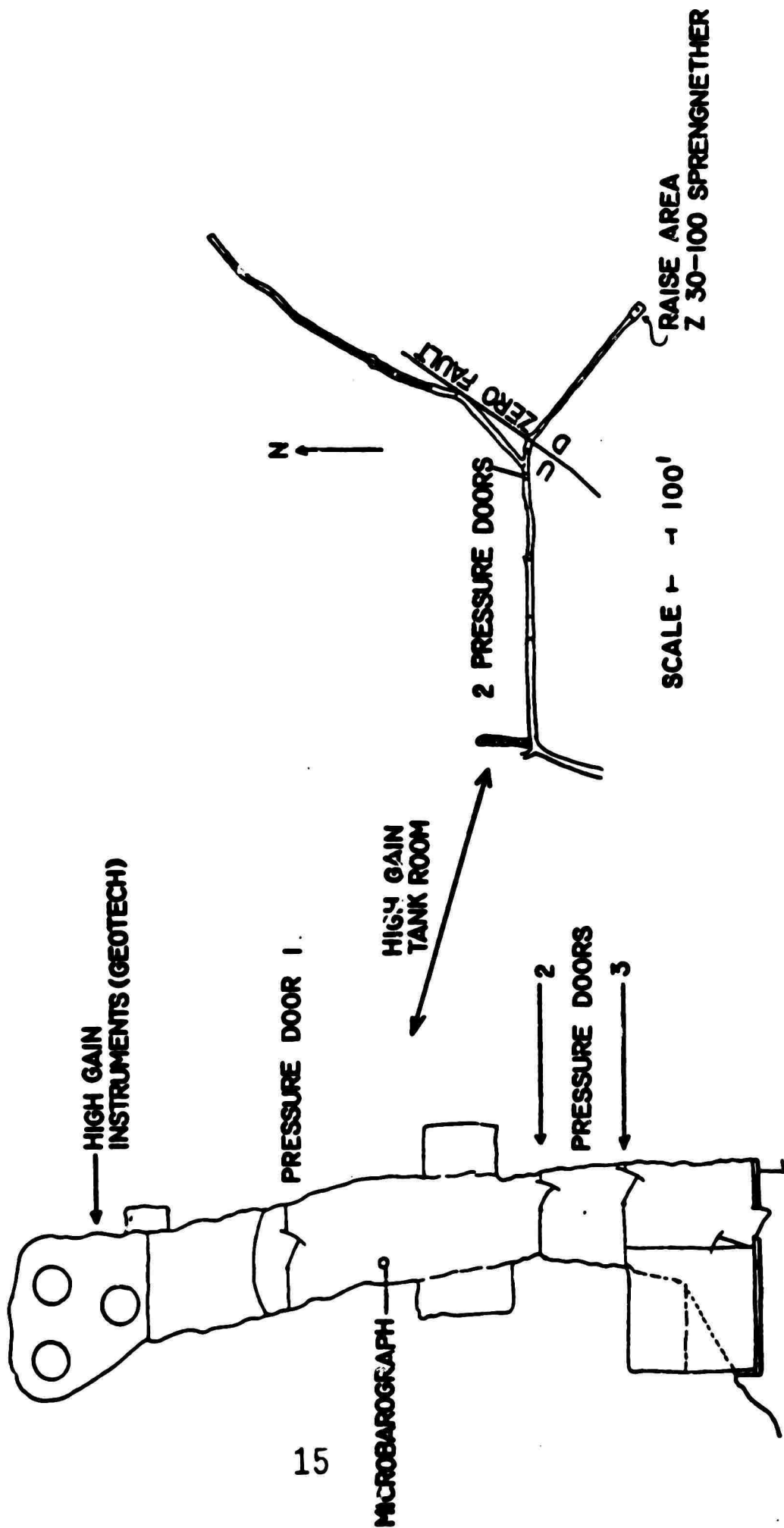
Figure 4. Map of Lamont's seismic observatory at Ogdensburg, New Jersey, 1850 feet below the surface.

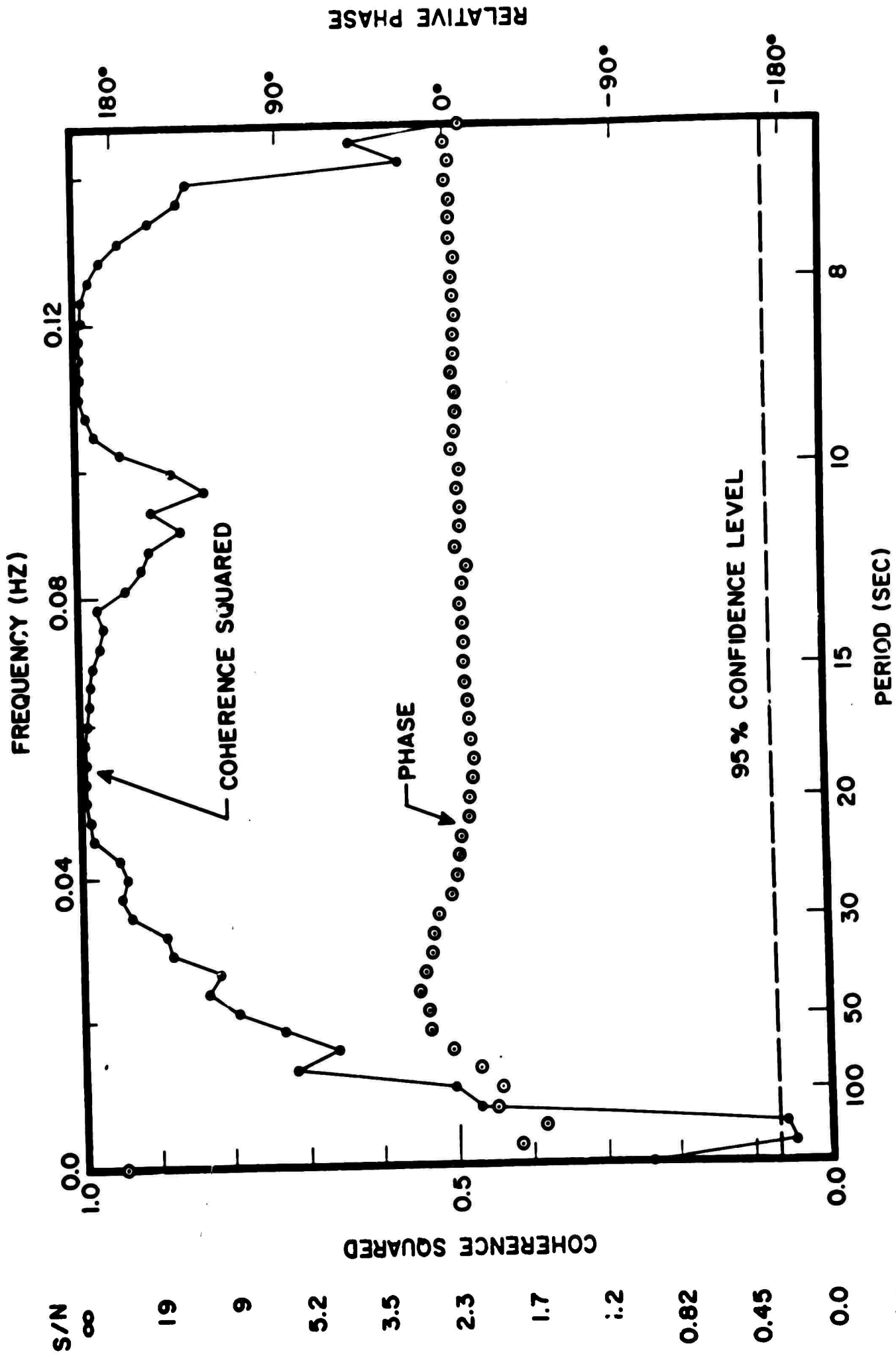
Figure 5. Coherence squared and phase relation for a 5 hour and 14 minute portion of background noise at a Sprengnether and a Geotech seismometer spaced 500 feet apart in different environments in the Ogdensburg Mine.









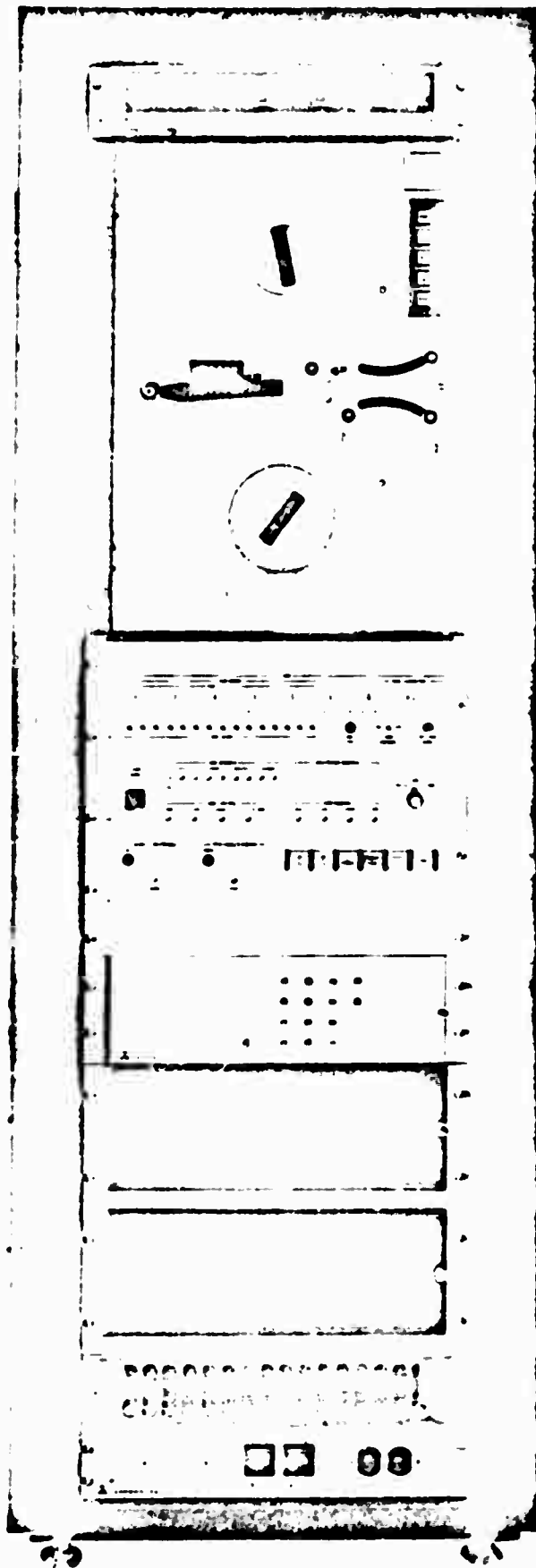


APPENDIX 1

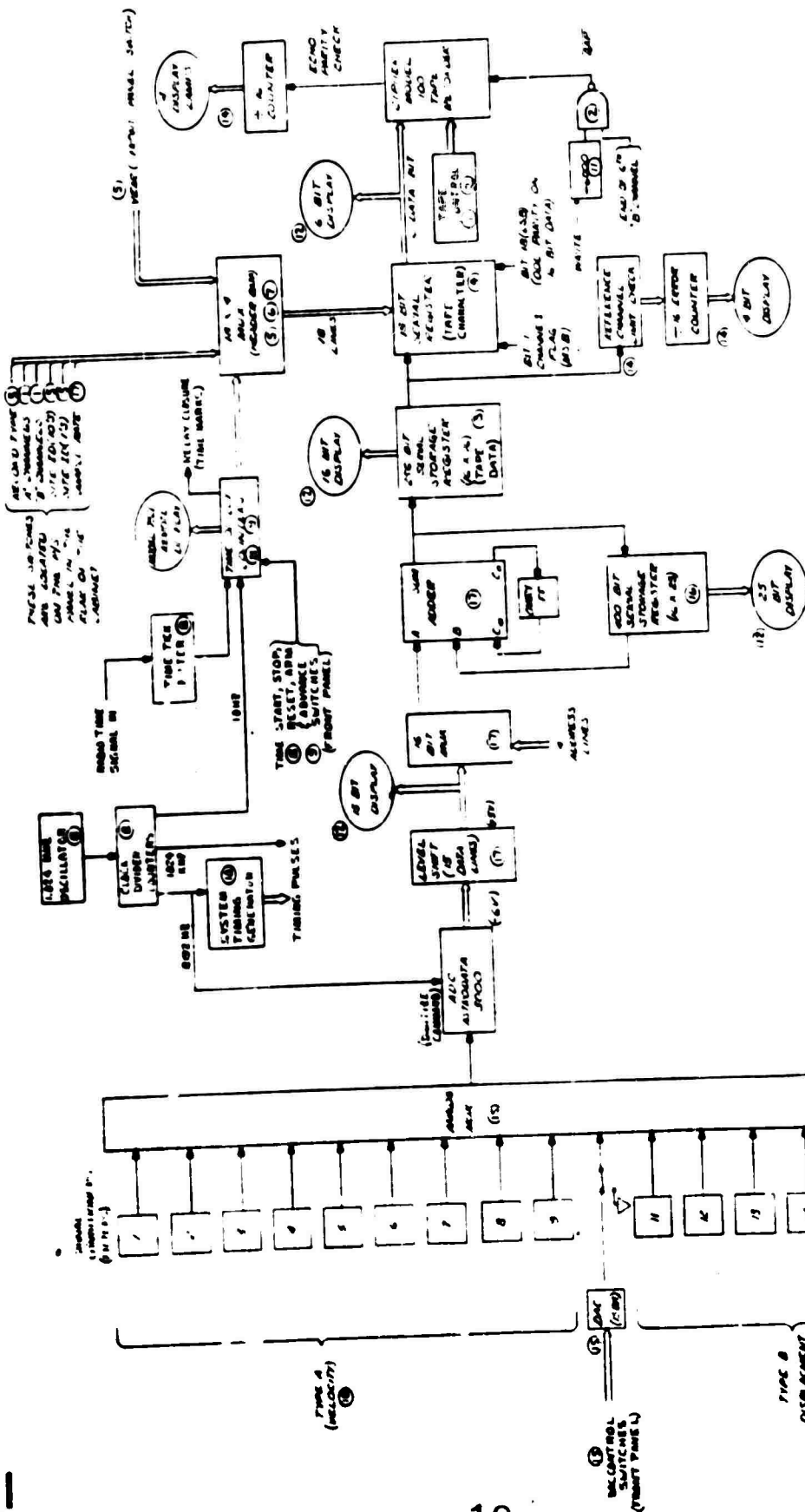
Data Logger System

General Theory of Operation and Tape Format

NOT REPRODUCIBLE



DATA LOGGER, PART NO. 7104500100



| | | | |
|-------------------------|------------|-------------------------|------------|
| DATE: 10/10/60 | | PAGE: 1 | |
| PROJECT: 100-100000 | | SUBJECT: 100-100000 | |
| DESIGNED BY: 100-100000 | | CHECKED BY: 100-100000 | |
| DRAWN BY: 100-100000 | | APPROVED BY: 100-100000 | |
| REVISIONS: | | REVISIONS: | |
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| 95 | 100-100000 | 96 | 100-100000 |
| 97 | 100-100000 | 98 | 100-100000 |
| 99 | 100-100000 | 100 | 100-100000 |

4-2. GENERAL THEORY OF OPERATION

A block diagram of the Data Logger system is shown on drawing 1208900100. This block diagram illustrates the primary functions of the system and is used as a basis for the general description contained in the following paragraphs. The functional flow of data is shown from left-to-right wherever possible.

4-3. SIGNAL INPUTS

The inputs to the Data Logger are shown on the left hand side of the drawing. These inputs consist of 9 channels of analog velocity data (channels 1-9) 1 analog test channel supplied from a DAC or ground (channel 10), and 6 channels of analog displacement data (channels 11-16). Channels 1 through 9 are designated type A inputs, channels 11 through 16 are designated type B inputs, and channel 10 is designated as a test input. These inputs, with the exception of the test channel, are routed through signal conditioning filters to an analog multiplexer. Electrical characteristics for the input signals and conditioning filters are given in table 1-2.

Channel 10 (test input) receives inputs from a 15 bit DAC when local tests are conducted on the system. Fifteen DAC input switches on the control panel are used to set the analog output of this DAC. A switch is also provided on the control

panel to set the channel 10 input to ground when DAC tests are not being conducted.

The system, as supplied by the manufacturer, only contains enough signal conditioning filters to accept three type A inputs (channels 1, 2, and 3) and three type B inputs (channels 11, 12, and 13). However, the system is prewired to accept all fifteen input channels if expansion is desired.

4-4. SIGNAL MULTIPLEXING

The conditioned signals from the input filters are applied to a 16-input analog multiplexer that sequentially selects each of the 16 channels at an 8192 Hz rate. Since there are 16 input channels, each channel is selected 512 times per second or 1024 times every two seconds. Channel selection is always in order, with channel 1 being selected first and channel 16 being selected last. The multiplexer selects channels 1 through 16 repeatedly on a continuous basis.

The outputs of the multiplexer are fed into an Astrodata Model 3000 Analog-to-Digital Converter (ADC) where they are converted into a parallel, 14 bits plus sign bit, digital output. The ADC digitizes the multiplexer outputs at an 8192 Hz rate so that each channel is digitized as it is selected by the multiplexer. Theory of operation information for the ADC is contained in the Model 3000 Analog-to-Digital Converter manual supplied with the Data Logger equipment.

4-5. LEVEL SHIFTING

The logic levels for the digital outputs of the ADC are zero volts for a logic 1 and -6 volts for a logic 0. Since these logic levels are incompatible with the integrated circuit (IC) logic levels that are used throughout the remainder of the Data Logger logic, these outputs are routed through level shifter circuits that convert the levels to +5 volts for a logic 0 and zero volts for a logic 1. The 15 bit parallel outputs from these level shifters are supplied to a 15 bit indicator display on the control panel and inverted and supplied to a digital multiplexer for data integration.

4-6. DATA INTEGRATION

The data integration logic, as shown on the block diagram, consists of the adder, the carry flip-flop, and the 400 bit serial storage register or summing register. This logic performs the function of arranging the digital inputs from the level shifters into 16 channels of information containing 25 bits of summed data per channel. When the sum is completed, this 25 bits of data represents processed average data for a given channel.

The averaging process is accomplished by summing each of the channel inputs a selected number of times up to a maximum of 1024 summations. Since 1024 summations is equal to 2^{10} , 25 bits are required and allotted to each channel to prevent overflow. In other words 15 bits of data that has been summed 1024 times is left shifted by 10 bits. Therefore the 15 most significant bits of data in the 25 bit word represent the processed average data for that channel (although 16 rather than 15 bits are saved in order to reduce round-off error). Since 25 bits

are required for each channel, and there are 16 channels of data, a 400 bit summing register is provided to store the data for all of the channels.

As data for a given channel is serially fed into the adder by the 16 bit multiplexer, the previous value of that channel is also being serially routed into the adder from the summing register. The two values are then summed together and the new data is routed back into the summing register where it is stored until the next summation is performed for that channel. A given channel of 25 bits that is stored in the summing register can also be selected for display on the front panel indicators.

Although data from all 16 channels is routed into the multiplexer in order, the B type channels are only summed on every 5th cycle. Timing and control circuits in the system generate a disable term that is applied to the multiplexer four out of every five cycles when the B type channels are multiplexed. When this term is applied, the output of the multiplexer is inhibited and a string of logic 0's are routed into the adder for that particular channel. Therefore, after the summing register processes the B channel sum will remain unchanged four out of five times.

After the selected number of summations are completed for a given channel, the resulting sum is divided by the number of summations to obtain an average data value. The averaged value is then shifted into the tape data register. The division is done by shifting the binary point since the divisions are binary multiples. This division is done as the number is being shifted into the tape register by selecting the appropriate 16 bits out of the 25 bit sum.

During the summation cycle which completes the sum for 1 or more channels, the 16 appropriate bits out of the 25 for each channel are routed into a 256 bit serial storage register, or tape data register as it is labeled on the front panel. At the same time, the 400 bit summing register is reset to zero (for those channels whose sum is complete) in order to initialize it for the next cycle. When the 256 bit serial storage register is completely filled it contains 16 bits of information for 16 channels. Of course, in 4 out of every 5 cycles only the A channel register positions contain significant information since the B channel sums were not completed.

The number of shift cycles per second from the summing register into the serial storage register is controlled by the SAMPLE RATE switch located on the power supply support assembly, drawing 2234000100. This switch also controls the number of summations that will be performed in a given cycle by the adder. When a sample rate of 0.5 is selected each channel will be summed 1024 times and will be shifted into the serial storage register once every 2 seconds. When a sample rate of 1.0 is selected, each channel is summed 512 times and shifted into the serial storage register once every second. In this case the most significant bit of the 25 data bits in the summing register is bypassed and the next most significant 16 bits are shifted into the serial storage register. When a sample rate of 2.0 is selected, each channel is summed 256 times, the first two most significant bits are bypassed and the remaining 16 most significant bits are shifted into the serial storage register once every 0.5 seconds. When a sample rate of 4.0 is selected, each channel is summed 128 times, the first three most significant bits are bypassed, and the remaining 16 most significant bits are shifted into the serial storage register once every 0.25 seconds.

4-7. DATA FORMATTING

When the 256 bit serial storage register is completely loaded, data averaging is complete and the data formatting process is begun. Data formatting is accomplished by the 18 bit serial register or tape character register as it is labeled on the front panel.

The 16 channels of 16 bit data are loaded serially into the tape character register from the tape data register one at a time. Each of these 16 bit words occupies in turn the middle 16 positions in the 18 bit tape character register. The most significant bit position is occupied by a channel 1 flag bit that is true only when channel 1 data is loaded. The least significant bit position is occupied by a parity bit that represents odd parity on the 16 data bits only.

In addition to channel data from the tape data register, tape record information (header data) is also loaded into the tape character register in parallel from the header data multiplexer. This information consists of four 18 bit words that are loaded into the tape character register and written on tape prior to loading and writing channel data. The contents and generation of header data words will be described later in this chapter. The emphasis here is that header data is loaded and written first followed by channel data to complete a tape record. The 18 bit header data words do not contain a channel 1 flag bit or a parity bit.

The header data and channel data words are transmitted to the tape, 6 bits at a time until the entire 18 bit word is written. To accomplish this, the 6 most significant bits of the tape character register are transmitted to the tape, the register is then right shifted 12 bit positions and looped back into itself, the next 6 most significant bits are transmitted out, the register is again right shifted 12 times and looped, and finally the last group of 6 bits is transmitted out. The 6 bit group of output data is available to a front panel display.

4-8. TAPE CONTROL

The tape control logic is provided to control the tape transport functions such as step/write, busy, ready, stop, and forward. In addition to these functions a divide by 6000 counter is provided to control the generation of a 0.75 inch gap on the tape after the record has ended. The divide by 6000 counter is used to count tape characters. Since each tape character contains 6 bits and there are 3 tape characters required for each 18 bit word, the counter actually functions as a divide by 2000 word counter. The reason for this divide by 2000 function is that a tape record is specified to consist of at least 2000 18 bit words, including the four header data words. After the record has been completed, the counter causes a gap command to be sent to the tape transport, which then generates a 0.75 inch gap on the tape. However, since the record is specified to consist of multiples of the 16 possible channels, the divide by 2000 counter output is gated with an "end of the last B channel" signal which delays the gap command until multiples of the 16 channels are contained in the tape record.

The "number of channels to be written" and "step/write" functions of the tape control logic provide the means to select the actual number of A type channels and B type channels that will be written on the tape. All 16 channels are processed up to this point regardless of how many are actually implemented. The test channel and those channels for which there is no hardware implementation are prevented from being written on tape by these circuits. In other words if only three A channels are selected, the 6 remaining A channels in a given cycle, starting with channel 4, will not be written on tape because the step/write command is inhibited. Any number of A channels and B channels can be selected with the exception that there must always be at least one A channel.

4-9. HEADER DATA

The header data is generated by the logic shown at the top of the block diagram. This logic consists of the 1.024 MHz oscillator, the clock divider counter, time tick filter, time of day counters, header data multiplexer, and front panel switches.

The oscillator and clock divider counters generate a 0.1 sec timing signal (10 Hz) that is applied to a time of day counter. The time of day counter supplies time of day information to the header data multiplexer.

In addition to the timing input from the clock divider counter, a timing input can also be supplied to the time of day counter from the external time tick filter. This filter receives a modulated carrier wave in the form of sine-wave bursts. This signal is transformed into a digital time tick that is supplied to the time of day counter in place of the internally

generated timing signal if desired. The time-of-day count is available on a display panel located on the front of the cabinet.

In addition to time-of-day information, the header data words also include record type, station identification, year identification, number of channels selected, and sample rate information. All of this information is generated by manually set switches located primarily on the Data Logger front panel. All of this information is routed to the multiplexer in parallel and multiplexed into the tape character register as 18 bit parallel digital words. A sample of four words of header data is shown in figure 4-1.

4-10. ERROR INDICATION

When the system is being operated in the test mode, an error indication is provided on the front panel display to verify the accuracy of test channel information that is being processed in the system. This error indication counts the number of errors processed and displays this count as a 4 bit BCD code.

| <u>BIT</u> | | <u>WORD 1</u> <u>BIT DISPLAY</u> | | <u>WORD 2</u> <u>BIT DISPLAY</u> | | <u>WORD 3</u> <u>BIT DISPLAY</u> | | <u>WORD 4</u> <u>BIT DISPLAY</u> | |
|------------|----|----------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------------------|---|
| MSB | 1 | TYPE | 1 | 100Day2 | 1 | 10Min4 | 1 | GND | 0 |
| | 2 | GND | 0 | 100Day1 | 0 | 10Min2 | 0 | GND | 0 |
| | 3 | 10ID8 | 1 | 10Day8 | 1 | 10Min1 | 1 | S8 | 0 |
| | 4 | 10ID4 | 0 | 10Day4 | 0 | 1Min8 | 0 | S4 | 1 |
| | 5 | 10ID2 | 1 | 10Day2 | 1 | 1Min4 | 1 | S2 | 0 |
| | 6 | 10ID1 | 1 | 10Day1 | 0 | 1Min2 | 0 | S1 | 0 |
| | 7 | GND | 0 | 1Day8 | 0 | 1Min1 | 0 | GND | 0 |
| | 8 | GND | 0 | 1Day4 | 1 | 10Sec4 | 1 | GND | 0 |
| | 9 | 1ID8 | 1 | 1Day2 | 0 | 10Sec2 | 0 | GND | 0 |
| | 10 | 1ID4 | 0 | 1Day1 | 1 | 10Sec1 | 1 | BCHAN4 | 0 |
| | 11 | 1ID2 | 1 | GND | 0 | 1Sec8 | 0 | BCHAN2 | 1 |
| | 12 | 1ID1 | 1 | GND | 0 | 1Sec4 | 1 | BCHAN1 | 1 |
| | 13 | GND | 0 | 10HR2 | 1 | 1Sec2 | 0 | SR0.5 | 1 |
| | 14 | GND | 0 | 10HR1 | 1 | 10HR1 | 0 | SR1 | 0 |
| | 15 | 1YR8 | 0 | 1HR8 | 0 | .1Sec8 | 1 | SR2 | 0 |
| | 16 | 1YR4 | 1 | 1HR4 | 0 | .1Sec4 | 1 | SR4 | 0 |
| | 17 | 1YR2 | 0 | 1HR2 | 1 | .1Sec2 | 0 | GND | 0 |
| LSB | 18 | 1YR1 | 1 | 1HR1 | 1 | .1Sec1 | 0 | GND | 0 |

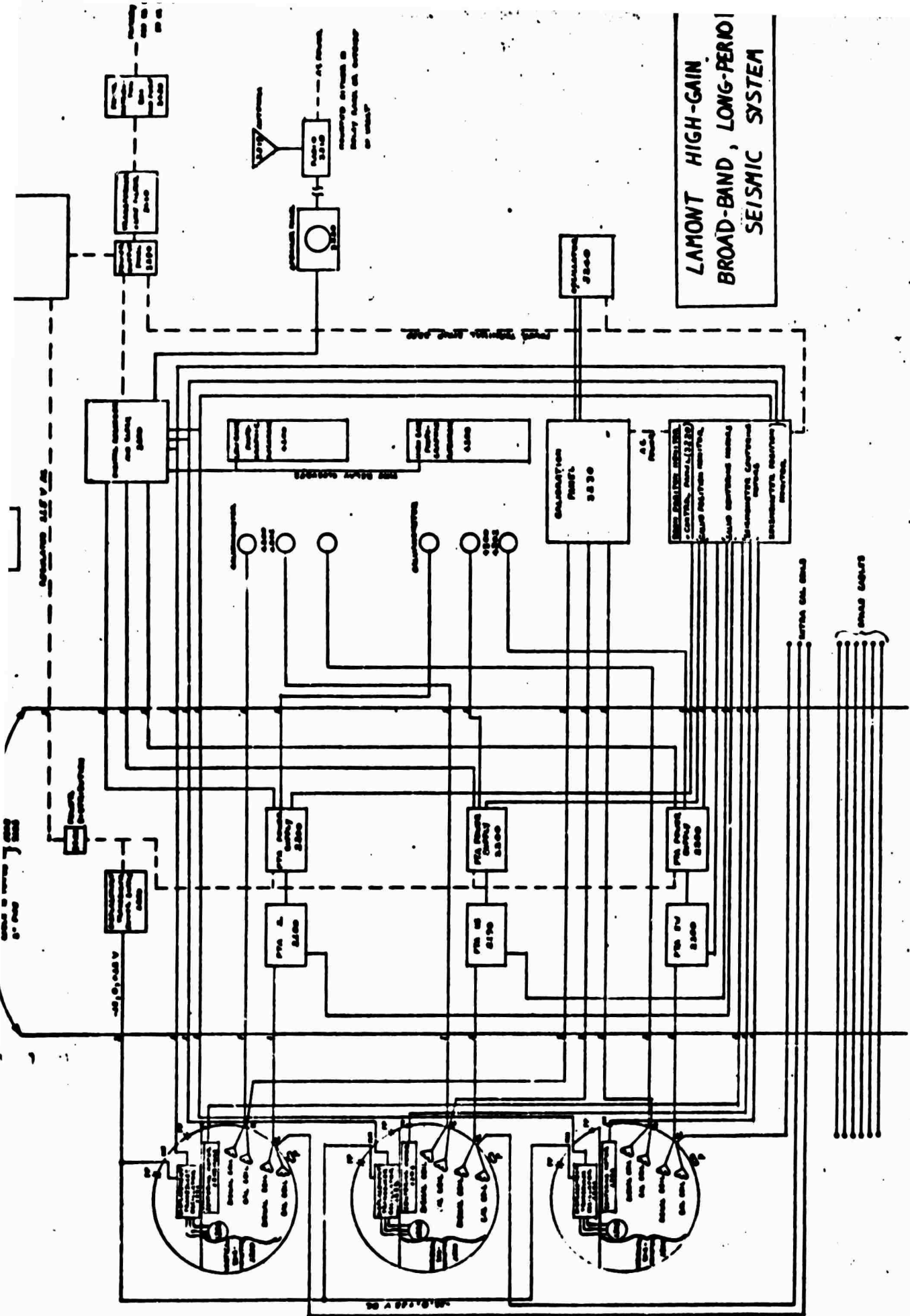
Figure 4-1. Sample Four-Word Header

APPENDIX 2

Detailed parts list and drawings

See text for description

LAMONT HIGH-GAIN BROAD-BAND, LONG-PERIOD SEISMIC SYSTEM



| DGO PART NUMBER | P R E L I M I N A R Y P A R T S L I S T D E S C R I P T I O N | QUANTITY PER STATION | DETAILED DRAWING | MANUFACTURER | MANUFACTURER PART # |
|-----------------------|--|-------------------------|---------------------|--------------|------------------------|
| | | | | | |
| 1100 | PRESSURE TANK AND GASKET | 3 | Y | PHOENIX | 1006-D-5386 |
| 1101 | POTTING ASSEMBLY | 1 | X | LAMONT | |
| 1102 | PIPE ADAPTER FOR MARCH-MARINE CONNECTOR | 6 | X | LAMONT | |
| 1104 | PRESSURE VALVE | 3 | X | LAMONT | |
| 1105-1 | WATERPROOF BULKHEAD CONNECTOR (INDIVIDUAL LEADS) | 6 | | VECTOR | XFK 6 BCL-6P |
| 1105-2 | MATING BULKHEAD CONNECTOR | 6 | | VECTOR | 13M"S"GSFS |
| 1105-3 | PLASTIC LOCKING SLEEVE | 6 | | VECTOR | 71-090 |
| 1106 | PIPE PLUG, 1" | 2 | | | |
| 1107 | 3/4" ROOF BOLT ANCHORS | 18 | | | |
| 1108 | 3/4" x 10 THREADED ROD, NORMAL 6" LENGTHS | 18 | | | |
| 1109 | 3/4" x 10 NUTS | 18 | | | |
| 1110 | 3/4" x WASHERS | 18 | | | |
| 1111 | "C" CLAMP | 36 | | AIRSTRONG | 1 1/2 Heavy Duty |
| 1112 | 2"x2"x3/8" STEEL PLATES TO GO UNDER "C" CLAMPS | 36 | | LAMONT | |
| 1113 | HANDWINCH | 1 | | LUGALL | 1000-15 |
| 1114 | 1" COMPRESSION FITTING | 9 | | CROUCHHEADS | CGH 397 |

PRELIMINARY PARTS LIST

| DBO PART NUMBER | D E S C R I P T I O N | Q U A N T I T Y PER STATE | D E T A I L E DRAWING | M A N U F A C T U R E R | M A N U F A C T U R E R P A R T # | P R I C E |
|-----------------------|--|------------------------------|--------------------------|-------------------------|--------------------------------------|-----------|
| 1200 | VERTICAL SEISMOMETER | 1 | M | GEOTECH | S-11 | |
| 1201 | REMOTE CENTERING ASSEMBLY LESS MOTOR | 1 | | GEOTECH | 10075 | |
| 1202 | COIL ASSEMBLY 25" LEADERS ON CAL & NGNAL COILS | 6 | | GEOTECH | 15940 | |
| 1203 | 10 RPM 12 VDC MOTOR | 1 | | HAYDEN | K5331-P2-53 | |
| 1204 | DISPLACEMENT TRANSDUCER | 1 | M | SPRENGNEITHER | VCT202V | |
| 1205 | DISPL. TRANS. MOUNTING PLATE | 1 | X | LAMONT | | |
| 1206 | DISPL. TRANS. OSCILLATOR DISCRIMINATOR | 3 | M | SPRENGNEITHER | VCT201 | |
| 1207 | TERMINAL BLOCK | 1 | | LAMONT | | |
| 1208 | CABLE HOLDER | 1 | | LAMONT | | |
| 1300 | HORIZONTAL SEISMOMETER | 2 | M | GEOTECH | S-12 | |
| 1301 | LEG ADAPTER | 2 | X | LAMONT | | |
| 1302 | REMOTE CENTERING ASSEMBLY | 2 | M | SPRENGNEITHER | S-5018M | |
| 1303 | DISPLACEMENT TRANSDUCER | 2 | M | SPRENGNEITHER | VCT202H | |
| 1304 | TERMINAL BLOCK | 4 | | LAMONT | | |
| 1305 | TERMINAL BASE PLATE | 2 | X | LAMONT | | |

| PRELIMINARY PARTS LIST | | D E S C R I P T I O N | | QUANTITY PER STATION | DETAILED DRAWING | MANUFACTURER | MANUFACTURER PART # | PRICE |
|------------------------|----|---|--|-------------------------|---------------------|--------------|------------------------|-------|
| 2100 | | PHOTO TUBE AMPLIFIER, TURNABLE BASE | | 3 | M | GEOTECH | 5240B | |
| 2101 | | MOTOR FOR PTA, DC, 12V | | 3 | | HAYDEN | K5352PZ | |
| 2102 | | MOUNTING PLATE FOR MOTOR | | 3 | X | LAMONT | | |
| 2103 | | GALVANOMETER, 100 SEC, FIXED FOCUS, 500 OHM COIL CDRX 500- 3000 OHMS | | 3 | M | KINEMATRICS | LG-1 | |
| 2104 | | PTA MODIFICATION KIT (OPTIONAL, FOR GFE) | | 3 | | GEOTECH | 28660 | |
| 2200 | | PTA POWER SUPPLY | | 3 | M | GEOTEC I | 14486 | |
| 2201 | 34 | FILTER, HIGH CUT 0.033 SEC | | 6 | | GEOTECH | 6824-15 | |
| 2300 | | DISPLACEMENT POWER SUPPLY | | 1 | M | POWERMATE | UN1-164 | |
| 2301 | | MOUNTING PLATE FOR 2300 | | | X | LAMONT | | |
| 2302 | | MOUNTING CLAMP FOR 2301 | | | X | LAMONT | | |
| 2303 | | POWER OUTPUT PLATE FOR 2300 | | | X | LAMONT | | |
| 2400 | | QUAD BOX - 4" SQUARE | | 3 | | UNIVERSAL | 52171 | |
| 2401 | | DUPLEX RECEPTACLES | | 6 | | BRYANT | 5252 | |
| | | | | | | UNIVERSAL | RS8 | |

| PRELIMINARY PARTS LIST | | | DESCRIPTION | | | | QUANTITY PER STATION | | DRAWING DETAILS | | MANUFACTURER | MANUFACTURER PART # | PRICE |
|------------------------|--|--|--|--|--|--|-------------------------|---|--------------------|-----------|--------------|------------------------|-------|
| 3100 | | | DIGITAL DATA ACQUISITION SYSTEM | | | | 1 | M | | ASTRODATA | | | |
| 3101 | | | SIGNAL INPUT-OUTPUT CONNECTOR | | | | 12 | | | | | | |
| 3102 | | | AUXILIARY SLAVE TIME RELAY | | | | 1 | X | | LAMONT | | | |
| 3200 | | | RELAY RACK, SOLID BOTTOM, TAPPED 10-32 | | | | 1 | X | | PREMIER | | PBXA-70-24 | |
| 3201 | | | RACK SIDE PANEL, LIGHT GRA | | | | 2 | | | PREMIER | | FL-70-24 | |
| 3202 | | | CASTORS, 3" | | | | 1 set | | | PREMIER | | CA-5 | |
| 3203 | | | BLOWER | | | | 1 | | | PREMIER | | PMB-5-150 | |
| 3204 | | | DRAWER | | | | 1 | | | PREMIER | | DI916 | |
| 3205 | | | SHELF | | | | 1 | | | PREMIER | | RDS-319-22 | |
| 3206 | | | SIDE HINGED PANEL | | | | 1 | | | PREMIER | | SHP-819 | |
| 3207 | | | REAR PANEL | | | | 1 | X | | PREMIER | | FP-719 | |
| 3208 | | | LOUVERED PANEL | | | | 1 | | | PREMIER | | FPL-2919 | |
| 3209 | | | REAR DOOR | | | | 1 | | | PREMIER | | CD-33 | |
| 3210 | | | CHASSIS SUPPORT | | | | 1 pr. | | | PREMIER | | CSA-24 | |
| 3211 | | | SHELF | | | | 1 | | | PREMIER | | S-22-24 | |
| 3212 | | | PANEL, 7" | | | | 2 | | | PREMIER | | ARP-719 | |
| | | | | | | | 1 | X | | PREMIER | | ARP-519 | |

PRELIMINARY PARTS LIST

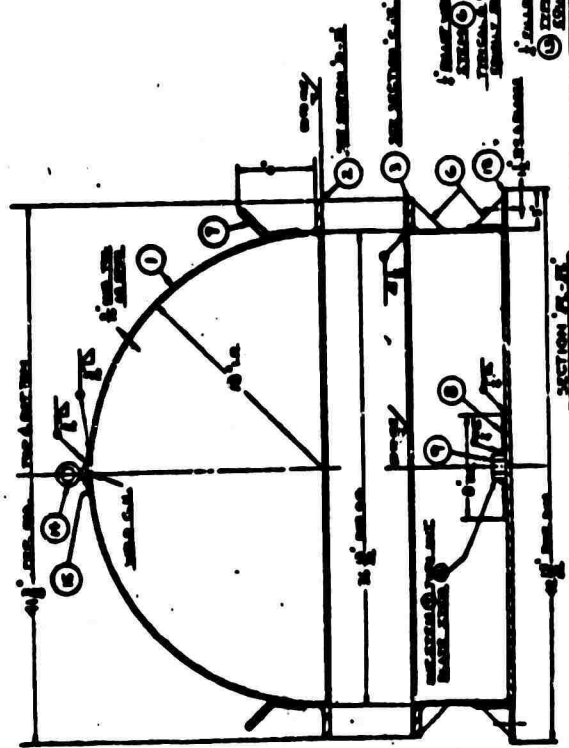
| DDO PART NUMBER | D E S C R I P T I O N | QUANTITY PER STATION | DETAIL DRAWING | MANUFACTURER | MANUFACTURER PART # | PRO |
|-----------------------|--|-------------------------|-------------------|--------------------|------------------------|-----|
| 3214 | PANEL, 5" | 1 | | PREMIER | ARP-519 | |
| 3215 | SPEAKER PANEL | | | PREMIER | SRP-819 | |
| 3216 | SPEAKER | 1 | | UTAH | V8 JCM | |
| 3217 | VOLUME CONTROL L-PAD ATTENUATOR, 4 OHM | 1 | | CENTRALAB | WLA | |
| 3218 | RADIO RECEIVER | | M | SPECIFIC PROD. | WVTR-A1 | |
| 3219 | ANTENNA | | | SPECIFIC PRODUCTS | AK-8 | |
| 3220 | BOOM POSITION MONITOR & CONTROL | | X | OAS | 70-026 | |
| 3230 | CALIBRATION PANEL | | X | OAS | 70-026 | |
| 3240 | OSCILLATOR, TRIGGERED VOG | | M | WAVETEK | 112B | |
| 3250 | NULL VOLTMETER | | M | HEWLETT PACKARD | 419A | |
| 3270 | VOLTAGE REGULATOR | 1 | M | WALLASS | WVR-1500 | |
| 3271 | SWITCH, DPDT, GAMP | 1 | | ARROW HART | 81024GB | |
| 3272 | SEGMENTAL VOLTMETER 100-130 VAC | 1 | | SIMPSON | 1349 | |
| 3273 | FUSE HOLDER | 2 | | BUSSMAN | HPC | |
| 3274 | FUSE , 10 AMP, 15 AMP | 2 | | FUSETRON | FNM | |
| 3275 | TERMINAL BOARD | 8 | | BUCHANAN | | |
| | | | | RECEIVING | RECEIVING | |

| PRELIMINARY PARTS LIST | | D E S C R I P T I O N | | QUANTITY PER START | DETAILED DRAWING | MANUFACTURER | MANUFACTURER PART # | PRICE |
|------------------------|----|--|--|-----------------------|---------------------|--------------|------------------------|-------|
| 3277 | | 4" x 4" CLOSING PLATES | | 2 | | KEYSTONE | KTCP40 | |
| 3278 | | 3 WIRE TWIST LOCK RECEPTACLE | | 4 | | BRYANT | 7328-G | |
| 3279 | | 3 WIRE TWIST LOCK PLUG | | 4 | | BRYANT | 9965 | |
| 3280 | | COMPRESSION CABLE CONNECTOR, 3/4" | | 12 | | C-H | CCEB296 | |
| 3281 | | GROUNDING LUGS | | | | BURNDY | KPA 4C | |
| 3299 | | POWER DISTRIBUTION STRIP | | 1 | | PREMIER | OB-170 | |
| 3410 | 37 | TRANSFORMER #0511T25ST 60cps 120/120V or #051T25ST-8274 50 cps 240/120V | | | M | TOPAZ | | |
| 3411 | | LINE FILTER | | 1 | M | TOPAZ | | |
| 3412 | | 6" x 6" x 4" UTILITY BOX AND COVER | | 2 | | SPRAGUE | FLUTERALL 3 | |
| 3420 | | POWER DISTRIBUTION BOX AND SWITCH | | 1 | | | | |
| 3421 | | CIRCUIT BREAKER 20 amp | | | | WESTINGHOUSE | CFB | |
| 3422 | | 30 amp 3 PIN RECEPTACLE | | 1 | | C-H | ARE 3373 | |
| 3423 | | 30 amp 3 PIN SOCKET | | 1 | | C-H | APJ 3373 | |
| | | | | | | | | |
| | | | | | | | | |

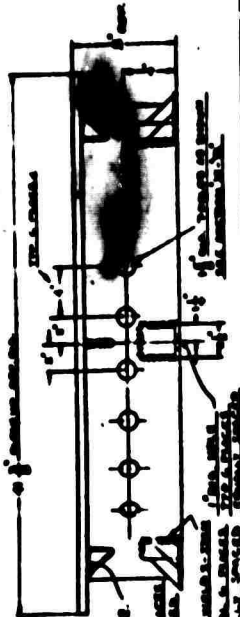
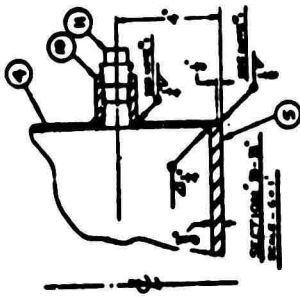
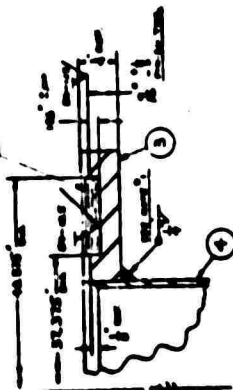
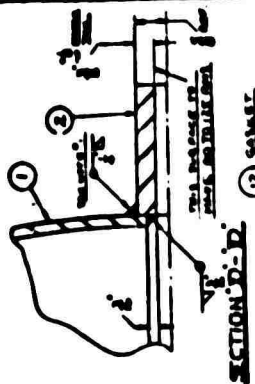
| PRELIMINARY PARTS LIST | | DESCRIPTION | QUANTITY PER STATIC DRAWING | DETAILED DRAWING | MANUFACTURER | MANUFACTURER PART # | PRICE |
|------------------------|--------|--|-----------------------------------|---------------------|------------------|-------------------------|-------|
| DGO ART NUMBER | | | | | | | |
| 4100 | | PHOTOGRAPHIC RECORDER | 2 | M | SPRENGNETHET | HR-6007 | |
| 4101 | | BRACKETS FOR STACKING RECORDERS (OPTIONAL) | 1 | | LAMONT | | |
| 4102 | | SPARE MOTOR FOR RECORDER | 1 | | BODINE | B8122E1800T 767VEK45 | |
| 4103 | | AUTOORDER, 3 COMPONENT (OPTIONAL IN PLACE OF 4100) | 2 | M | SPRENGNETHET | 6101 | |
| 4200 | | LONG PERIOD GALVANOMETER BASE | | X | LAMONT | | |
| 4201 | | LONG PERIOD GALVANOMETER, 100 sec. ADJUSTABLE FOCUS, CDRX 1000- 3500 ohms | | M | KINEMATICS | LG-1 | |
| 4202 | ω ∞ | LP GALVO RESISTIVE NETWORK | | | | | |
| 4300 | | SHORT PERIOD GALVANOMETER BASE | | X | LAMONT | | |
| 4301 | | BASE FOR USE WITH STACKED PHOTO RECORDERS (OPTIONAL) | 1 | | LAMONT | | |
| 4301 | | SHORT PERIOD GALVANOMETER | | | GEOTECH | G-10 | |
| 4302 | | SP GALVO RESISTIVE NETWORK | | | | | |
| 4350 | | FILTER GALVANOMETERS (OPTIONAL) 7 SEC | 3 | M | KINEMATICS | IG-1 MOD | |
| 4400 | | DEHUMIDIFIER | 1 | M | GENERAL ELECTRIC | EUJ25 | |

[illegible]

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- [illegible]

[illegible]



- 1 STAMP OR
PART NO. NOT
INDICATED
- 2 13 SURFACE
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WHERE NOT
- 3 ITEMS OF
INDIVIDUAL
BEFORE AS

LOCATE AT ASM
FROM. 094 DIA
PILOT HOLES

**1094
PILOT HOLES
FOR DOWELS**

A vertical ruler with markings from 0 to 2 inches. The markings are labeled 0, 1, and 2. The word "INCHES" is written vertically to the right of the ruler.

| ITEM | QTY | PART NO | DESCRIPTION |
|------|-----|---------|-----------------------------|
| 4 | | | COWEL 1750 DIAM 150 LG |
| 3 | | | CEP 500 WD 10-32 x 1.50 LG |
| 2 | | | BLOCK TOP 100 x 100 x 40 |
| 1 | | | BLOCK BOTTOM 100 x 200 x 40 |

| | |
|----------|------------------|
| CONTRACT | 12-100-0000-0000 |
| MADE BY | U.S.A. & C. |
| DATE OF | 12-10-1960 |
| PLACE OF | INDIA |

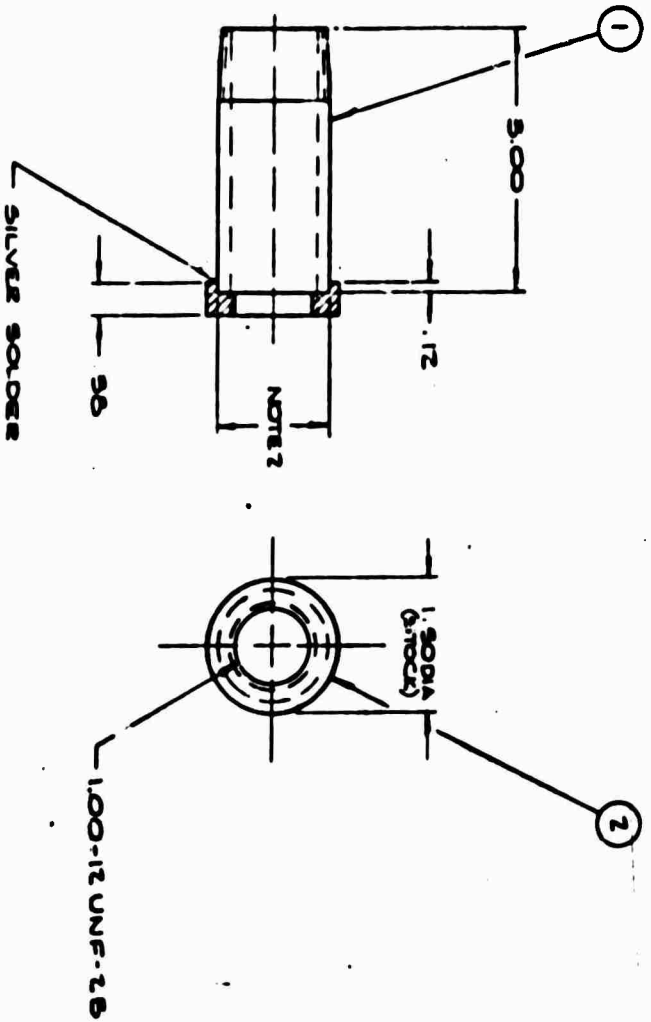


**LAMONT GEOLOGICAL
OBSERVATORY
OF COLUMBIA UNIVERSITY**

[illegible]

ASD

| REVISIONS | | | |
|-----------|-------------|------|----------|
| DATE | DESCRIPTION | DATE | APPROVED |



NOTES
 1 STAMP OR STENCIL PART
 NO WHERE INDICATED
 2 FIT 1.00 PIPE NIPPLE
 TO SUIT AT ASD.

45

0 1 2 3
 INCHES

| | |
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| MATERIAL | SEE STOCK |
| FINISH: | USF |

| | |
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| CONTRACT | 16-44420-70 C-2034 |
| DESIGNED BY | MOSELEY |
| CHECKED BY | MOSELEY |
| DATE | 7/11/70 |
| REVISIONS | |
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| 2 | REVISION |
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| 100 | REVISION |

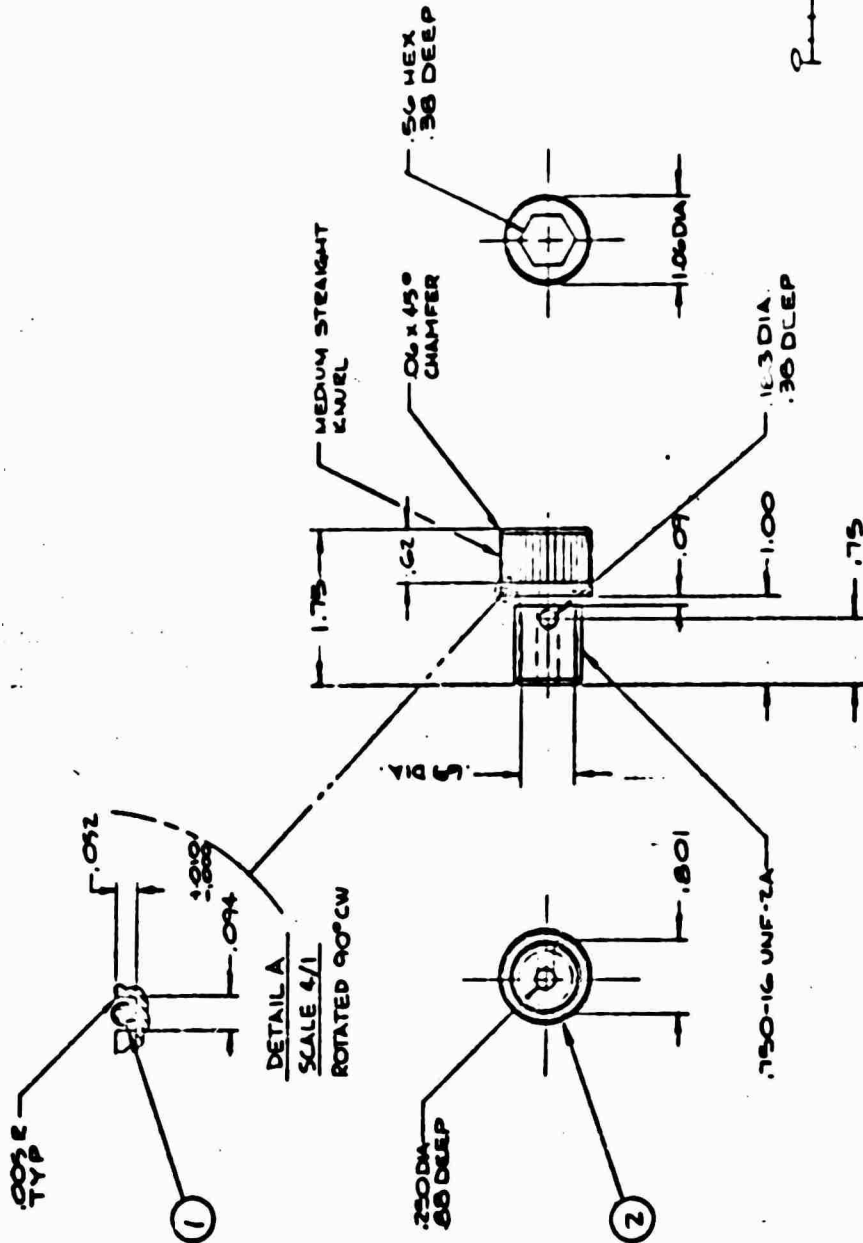
ADAPTER, PIPE

ASD

1 2 3 4 5 6 7 8 9 10 11 12
INCHES



| LETTER | DESCRIPTION | DATE |
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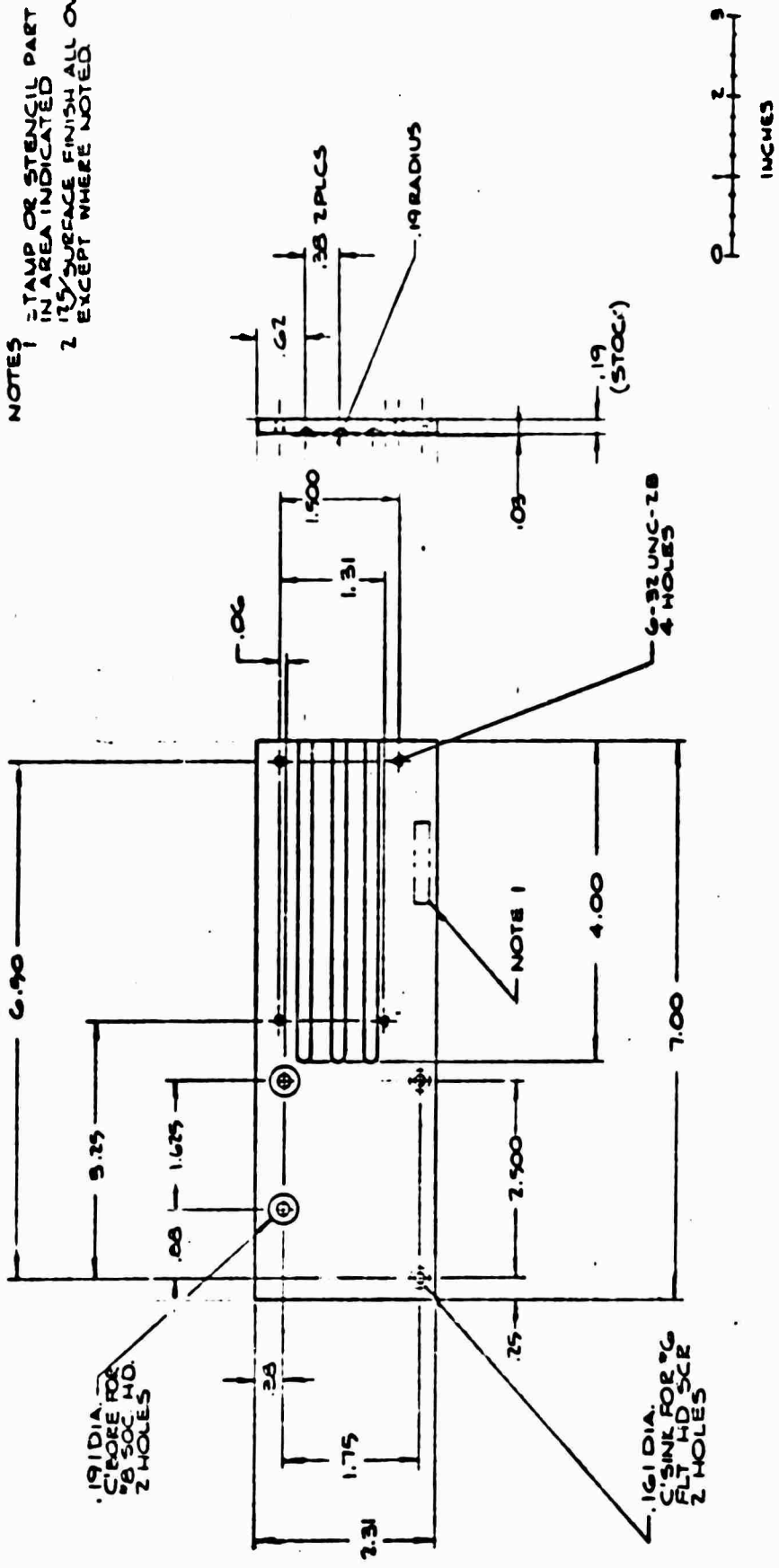


INCHES

NOTES
1. 125 SURFACE
ALL OVER BY
WHERE NOTED

| | | | |
|--|--|----------------------------------|--|
| LAWSON GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY | | SCREEN, 500 HD PRESSURE VALVE | |
| MATERIAL: SEE STOCK LIST | | FINISH: | |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES OF COLUMBIA UNIVERSITY | | 1104-1 | |

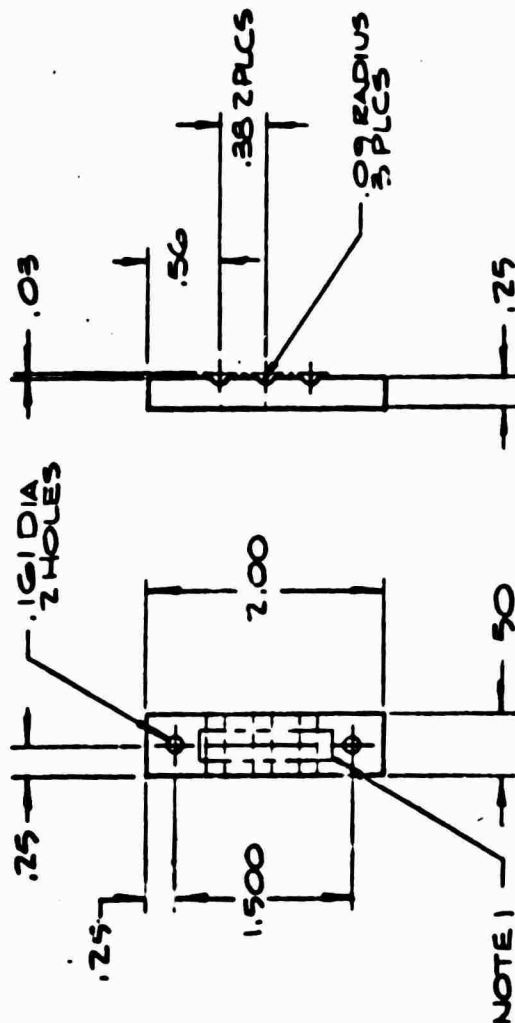
NOTES:
 1. STAMP OR STENCIL PART NO IN AREA INDICATED
 2. 125 SURFACE FINISH ALL OVER EXCEPT WHERE NOTED



| | | | | | |
|---|--|--|--|----------------------------------|--|
| | | CONTRACT # 62-00000000 ORDER BY 11 COSTAL 7/1/70 CHECK BY 11 ALUMINUM 7/1/70 PROJ. ENG. | | MATERIAL: ALUMINUM 7024-T4 | |
| PLATE, MOUNTING VERTICAL, DISPLACEMENT TRANSDUCER | | FINISH: 125 | | NEXT ASSEMBLY 1 | |
| SCALE 1/1 | | TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL ANGLES 1 1/2 2 1/2 3 1/2 4 1/2 5 1/2 6 1/2 7 1/2 8 1/2 9 1/2 10 1/2 11 1/2 12 1/2 13 1/2 14 1/2 15 1/2 16 1/2 17 1/2 18 1/2 19 1/2 20 1/2 21 1/2 22 1/2 23 1/2 24 1/2 25 1/2 26 1/2 27 1/2 28 1/2 29 1/2 30 1/2 31 1/2 32 1/2 33 1/2 34 1/2 35 1/2 36 1/2 37 1/2 38 1/2 39 1/2 40 1/2 41 1/2 42 1/2 43 1/2 44 1/2 45 1/2 46 1/2 47 1/2 48 1/2 49 1/2 50 1/2 51 1/2 52 1/2 53 1/2 54 1/2 55 1/2 56 1/2 57 1/2 58 1/2 59 1/2 60 1/2 61 1/2 62 1/2 63 1/2 64 1/2 65 1/2 66 1/2 67 1/2 68 1/2 69 1/2 70 1/2 71 1/2 72 1/2 73 1/2 74 1/2 75 1/2 76 1/2 77 1/2 78 1/2 79 1/2 80 1/2 81 1/2 82 1/2 83 1/2 84 1/2 85 1/2 86 1/2 87 1/2 88 1/2 89 1/2 90 1/2 91 1/2 92 1/2 93 1/2 94 1/2 95 1/2 96 1/2 97 1/2 98 1/2 99 1/2 100 1/2 | | SHEET 1 OF 1 | |

ASD

| LETTER | DESCRIPTION | DATE | APPROVED |
|--------|-------------|------|----------|
| | | | |



NOTES

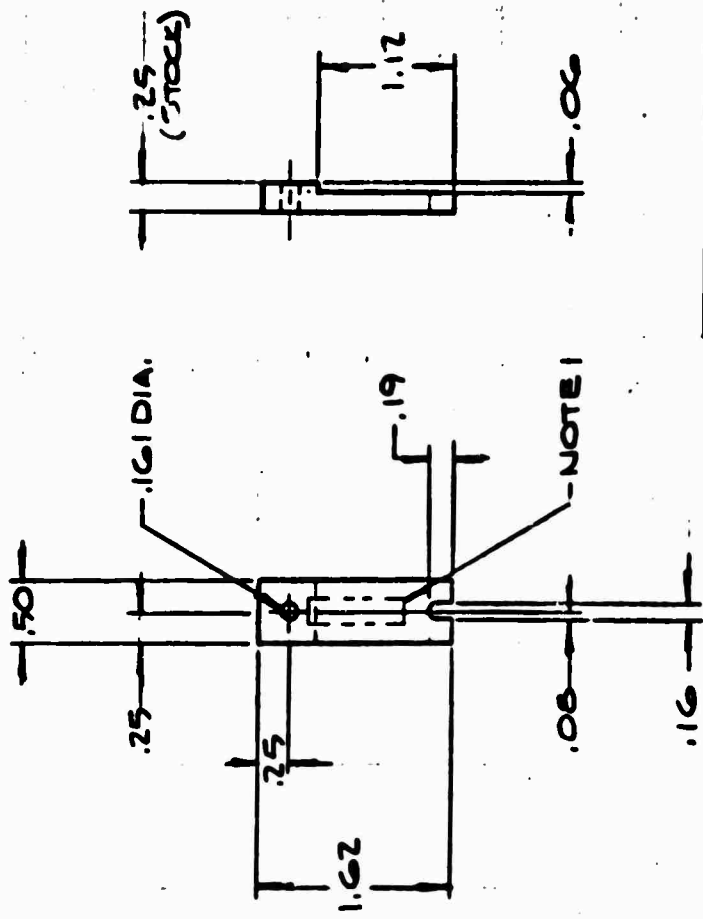
- 1 STAMP OR STENCIL PART NO. WHERE INDICATED
- 2 $1/25$ SURFACE FINISH ALL OVER EXCEPT WHERE NOTED



| | | | |
|---|--|---|--|
| | | LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY | |
| MATERIAL: ALUMINUM 2024-T4 | | FINISH: | |
| CONTRACT AF48-20-70C-0086 DESIGNED BY H. COSTALE 7/1/70 CHECKED BY W. KLINE 7/13/70 DATE 7/13/70 | | TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMALS .125 .02 .005 .005 .005 .005 | |
| CLAMP, WIRE | | SCALE 1/1 QUANTITY 1 DATE 1205-1 | |

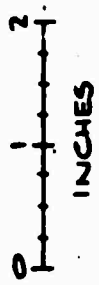
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| LETTER | REVISION | DATE | APPROVED |
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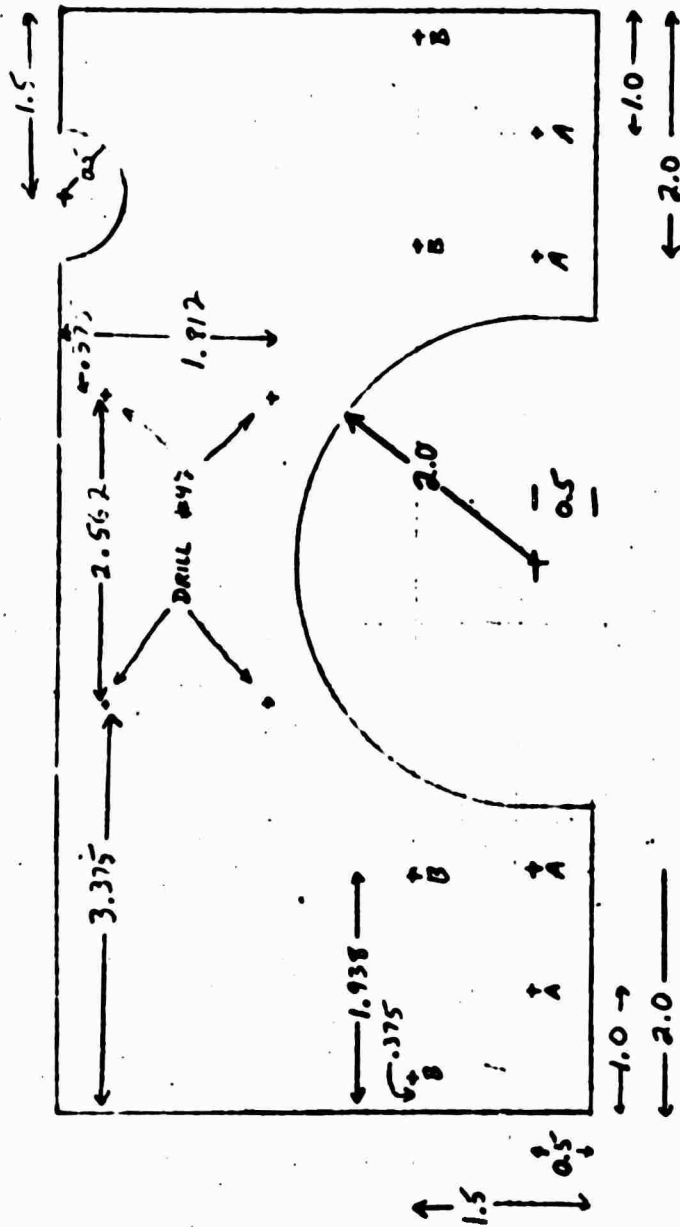
STAMP OR STENCIL PART
NO WHERE INDICATED
175 SURFACE FINISH ALL
OVER EXCEPT WHERE NOTED



| | | | |
|---|--|--|--|
| | | CONTRACT 16-440370-C-0398 DRAWN BY M. GOSWAMI, T. L. T. CHECK BY M. KUMAR, T. L. T. PULL LINE | |
| MATERIAL: ALUMINIUM 2024-T4 | | FINISH: 1 1 | |
| TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMALS .001 FRACTIONS 1/16 | | NEXT ASSEMBLY 1 | |
| CLAMP, WIRE | | DATE 12-05-2 | |

ASD

| LETTER | DESCRIPTION | DATE | APPROVED |
|--------|-------------|------|----------|
| | | | |



PLEXIGLASS 0.25 THICK

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

HORIZONTAL SEISMOGRAPH
TERMINAL STRIP BASE
PLATE

| | | | |
|----------|------|--------|--|
| DRW. NO. | 1305 | REV. | |
| SCALE | | WEIGHT | |
| SHEET | | OF | |

A TAP 6-32
B DRILL #33, COUNTER SINK
BOTTOM FOR FLATHEAD
BOLT, MOUNT 1304

| | |
|----------------------------|------------------|
| CONTRACT | 440128-7, 5-2-51 |
| DESIGNED BY | |
| CHECKED BY | |
| DATE | |
| TOLERANCES | |
| UNLESS OTHERWISE SPECIFIED | |
| DIMENSIONS ARE IN INCHES | |
| DECIMALS | 2 |
| FRACTIONS | 2 |
| ANGLES | 2 |
| THREADS | 2 |
| SPRINGS | 2 |
| SHOULDER ROUNDS | 2 |

| REVISIONS | | | |
|-----------|-------------|------|----------|
| LETTER | DESCRIPTION | DATE | APPROVED |

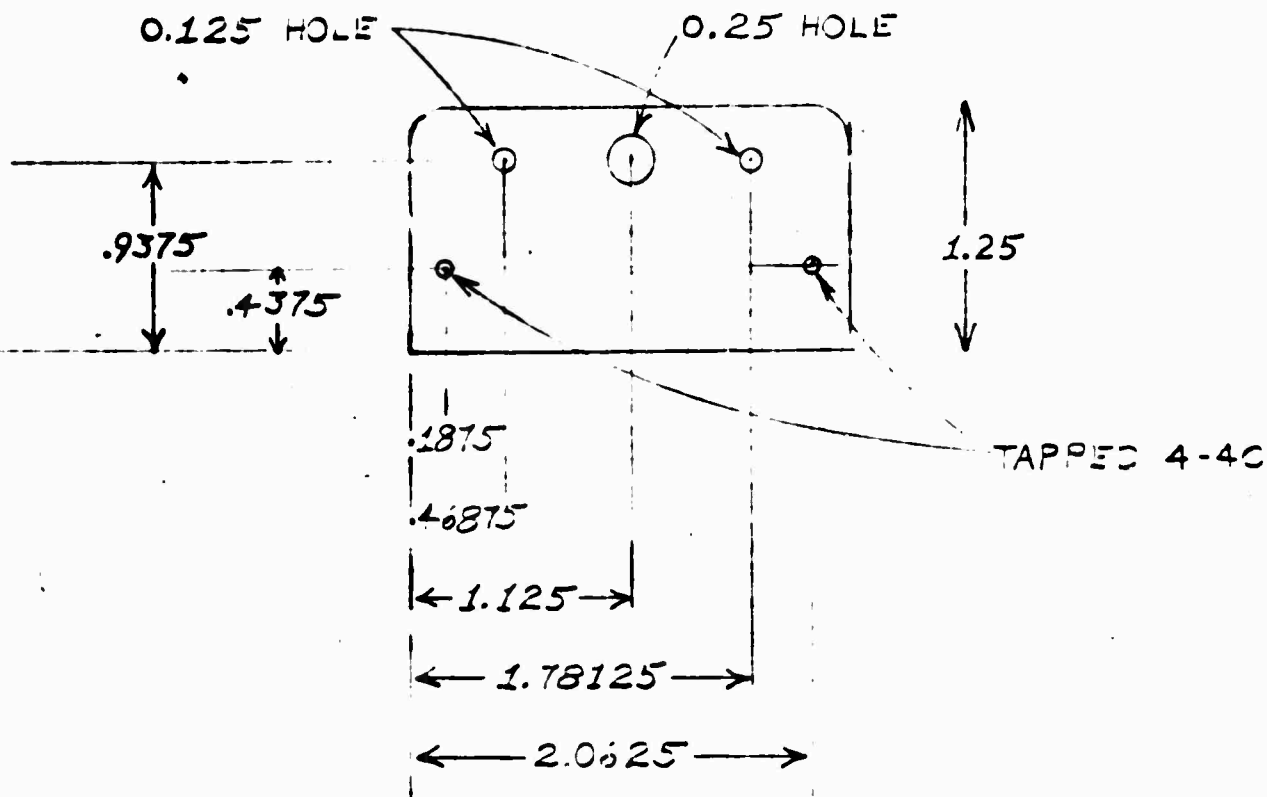
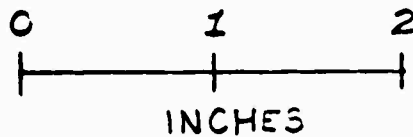



PLATE 1.25 X 2.25 X 0.125 ALUM

| | | | | | | | | | | |
|--|--------|--|--------|------|---|-------|--|--------|--|--|
| CONTRACT | |  <p>LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY</p> | | | | | | | | |
| DRAWN BY | | | | | | | | | | |
| CHECK BY | | | | | | | | | | |
| PROJ. ENGR. | | | | | | | | | | |
| <p>TOLERANCES: UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES</p> <table border="0"> <tr> <td>DECIMAL</td> <td>ANGLES</td> </tr> <tr> <td>.X ±</td> <td>±</td> </tr> <tr> <td>.XX ±</td> <td></td> </tr> <tr> <td>.XXX ±</td> <td></td> </tr> </table> <p>BREAK SHARP EDGES</p> | | DECIMAL | ANGLES | .X ± | ± | .XX ± | | .XXX ± | | <p>MOTOR MOUNTING PLATE PTA TURNTABLE</p> |
| DECIMAL | ANGLES | | | | | | | | | |
| .X ± | ± | | | | | | | | | |
| .XX ± | | | | | | | | | | |
| .XXX ± | | | | | | | | | | |
| DWG. NO. 2102 | | REV | | | | | | | | |
| SCALE 1/1 | WEIGHT | SHEET 1 OF 1 | | | | | | | | |

| REVISIONS | | | |
|-----------|-------------|------|----------|
| LETTER | DESCRIPTION | DATE | APPROVED |

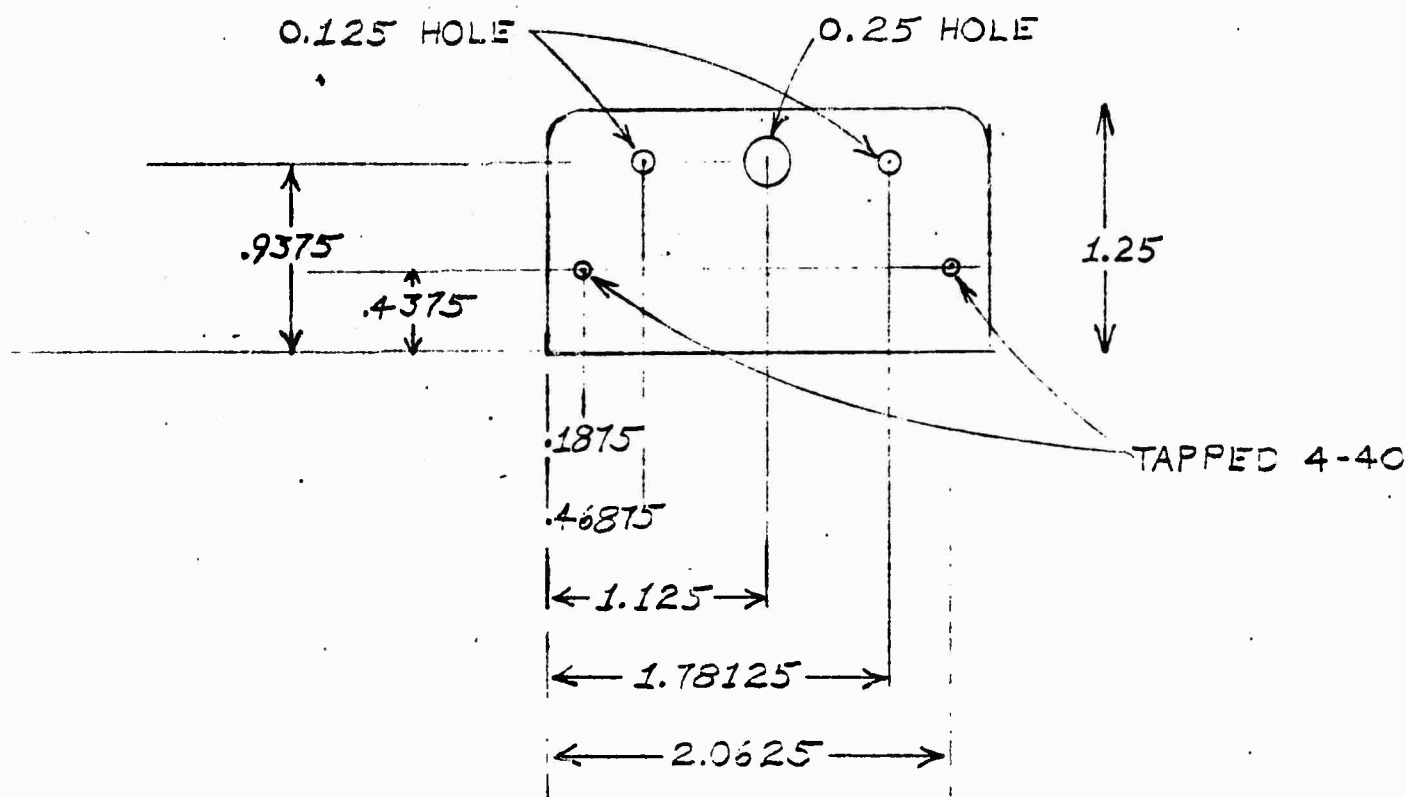
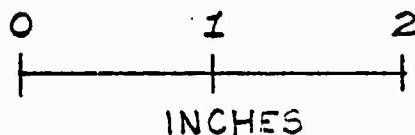


PLATE 1.25 X 2.25 X 0.125 ALUM

| | |
|-------------|-----------------|
| CONTRACT | AFM-55-73C-2247 |
| DRAWN BY | |
| CHECK. BY | |
| PROJ. ENGR. | |



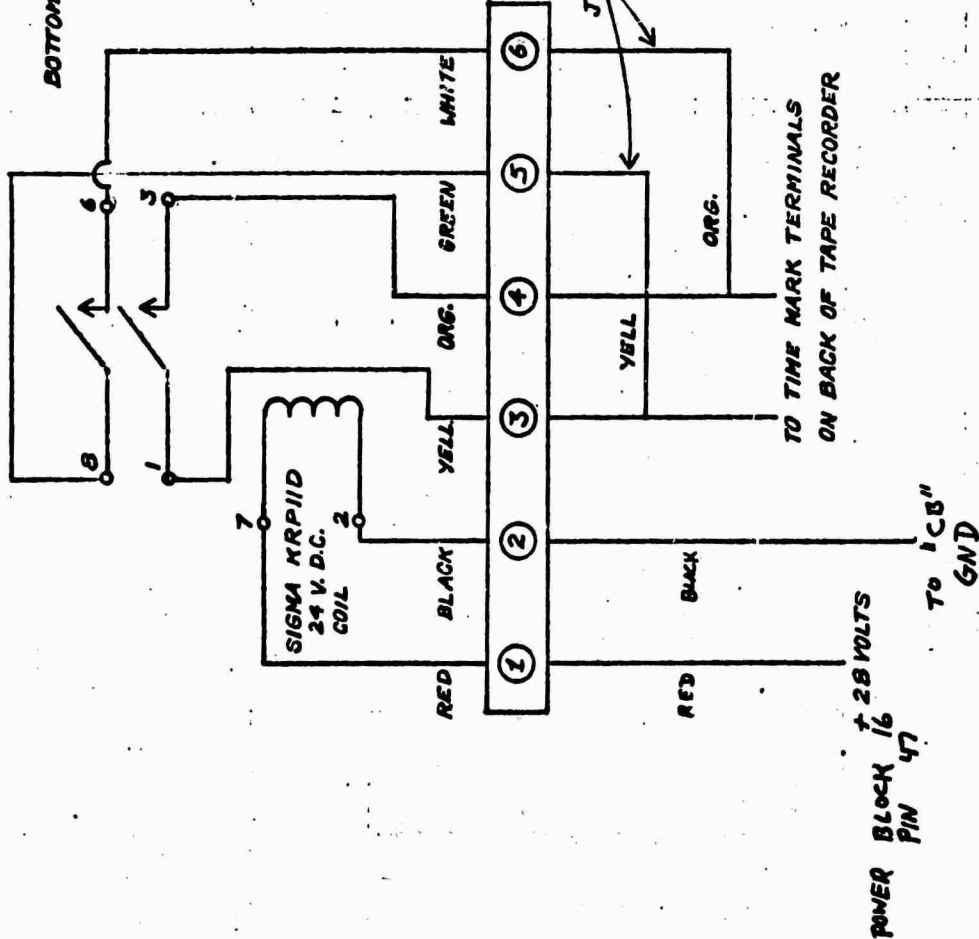
LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

TOLERANCES:
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL ANGLES
.X ± ±
.XX ±
.XXX ±
BREAK SHARP EDGES

MOTOR MOUNTING PLATE
PTA TURNTABLE

| | | | |
|----------|------|--------|---|
| DWG. NO. | 2102 | REV. | |
| SCALE | 1/1 | WEIGHT | |
| SHEET | 1 | OF | 1 |

AUXILIARY TIME RELAY MOUNTED ON A BRACKET

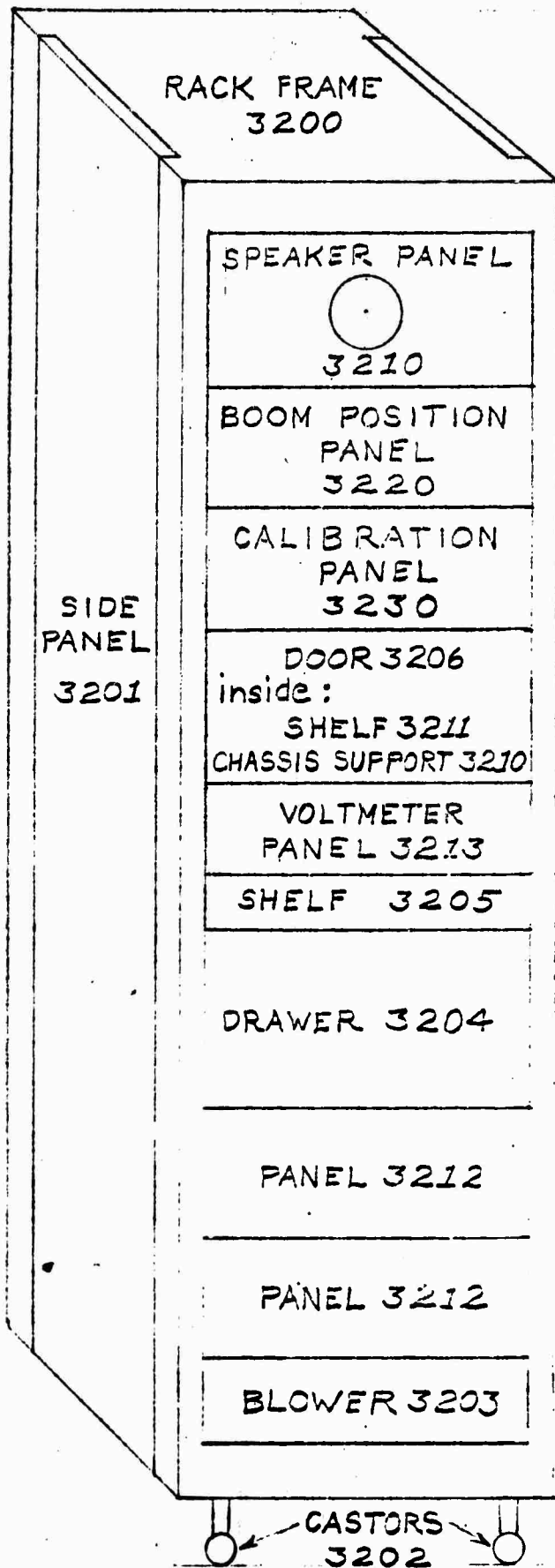


SEPARATE TIME SYSTEMS MAY BE ACTIVATED BY REMOVING THE YELLOW AND ORANGE JUMPERS BETWEEN 3 TO 5 AND 4 TO 6.

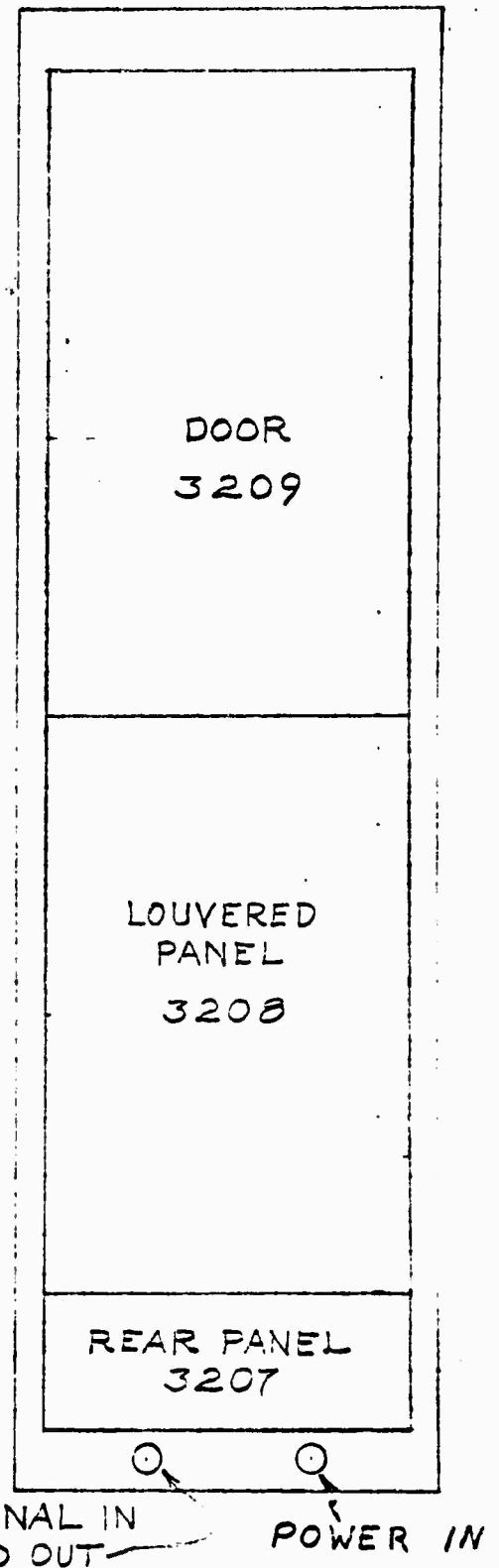
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|--|-------------|--|--------------|
| REVISIONS | | DATE | APPROVED |
| LETTER | DESCRIPTION | | |
| <p>LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY</p> | | <p>AUXILIARY "SLAVE" TIME RELAY - Digital Recorder</p> | |
| CONTRACT | DRAWN BY | DWG. NO. | REV. |
| CHECK BY | | 3102 | |
| FIELD ENGINEER | | SCALE | SHEET 1 OF 1 |
| <p>TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL FRACTIONS ANGLES BREAK SHARP EDGES</p> | | | |

CONTROL PANEL 3200

FRONT VIEW

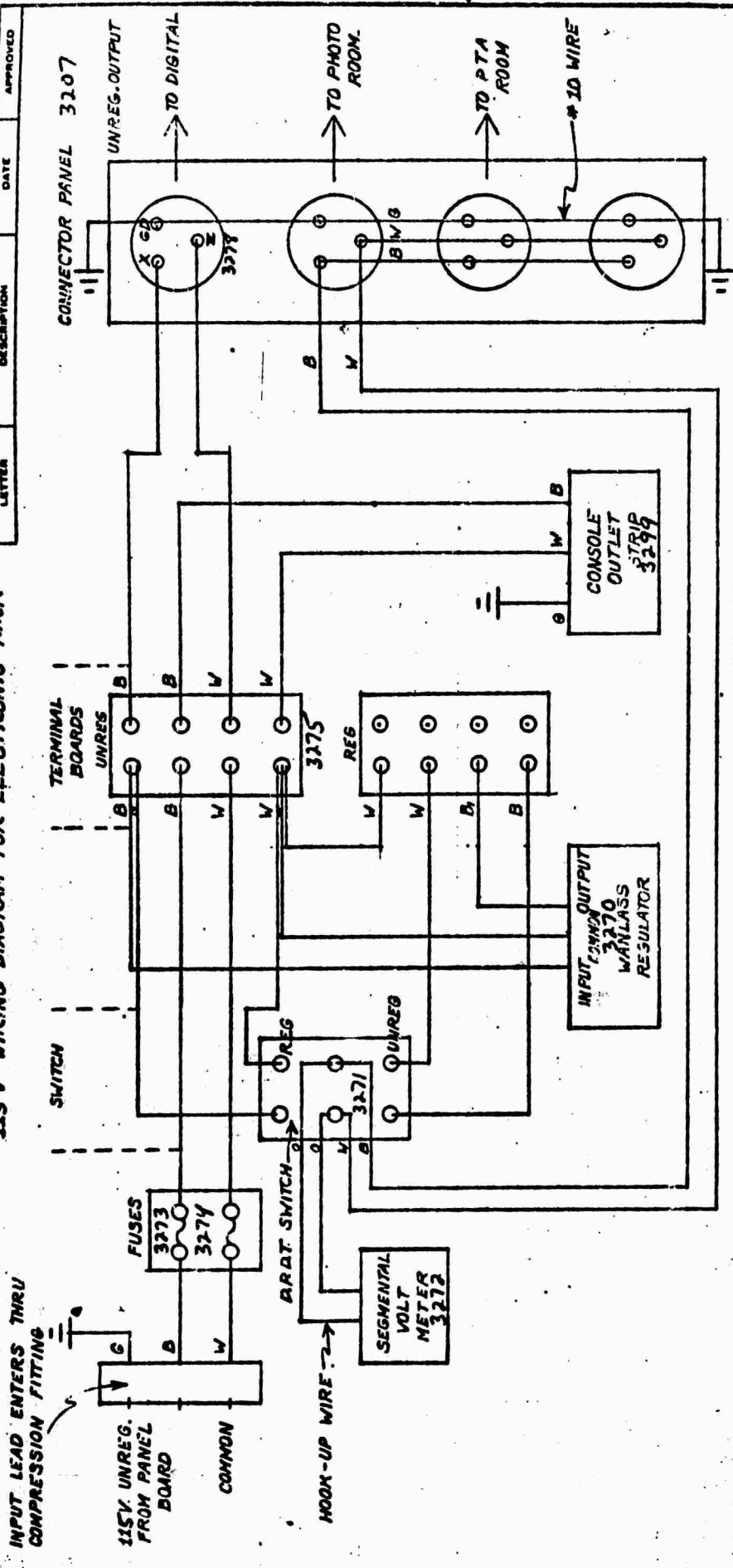


BACK VIEW



115V WIRING DIAGRAM FOR ELECTRONIC RACK

| LETTER | DESCRIPTION | DATE | APPROVED |
|--------|-------------|------|----------|
|--------|-------------|------|----------|



LAHONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

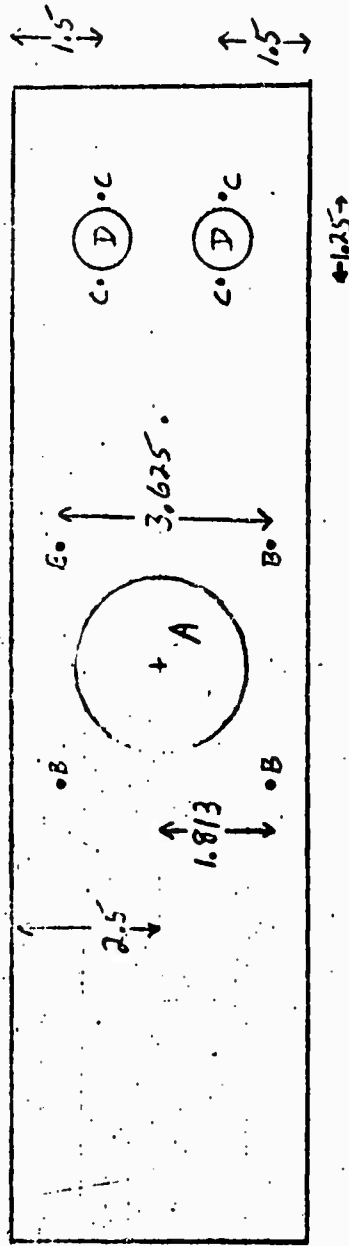
115V WIRING DIAGRAM FOR
ELECTRONIC RACK

| | |
|---|---|
| CONTRACT | |
| DRAWN BY | |
| CHECK BY | |
| PROL ENGR | |
| TOLERANCES | |
| UNLESS OTHERWISE SPECIFIED | |
| DIMENSIONS ARE IN INCHES | |
| DECIMAL | 1/16 |
| 1/32 | 1/32 |
| 1/64 | 1/64 |
| 1/128 | 1/128 |
| 1/256 | 1/256 |
| 1/512 | 1/512 |
| 1/1024 | 1/1024 |
| 1/2048 | 1/2048 |
| 1/4096 | 1/4096 |
| 1/8192 | 1/8192 |
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| REVISIONS | | |
|-----------|-------------|----------|
| LETTER | DESCRIPTION | DATE |
| | | APPROVED |

0 1 2 3
INCHES

9.5 → 7.0 → 4.0 →
← 2.0 ← 2.0 →



- A HOLE 2.8 DIAMETER, MOUNT PART # 3272
- B DRILL #28
- C TAP 6-32
- D HOLE 0.937, MOUNT PART # 3274

PANEL 5 X 19 PREMIER ARP-519

| | |
|------------|--------|
| CONTRACT | 5-7-72 |
| DRAWN BY | |
| CHECK BY | |
| PROJ. ENGR | |

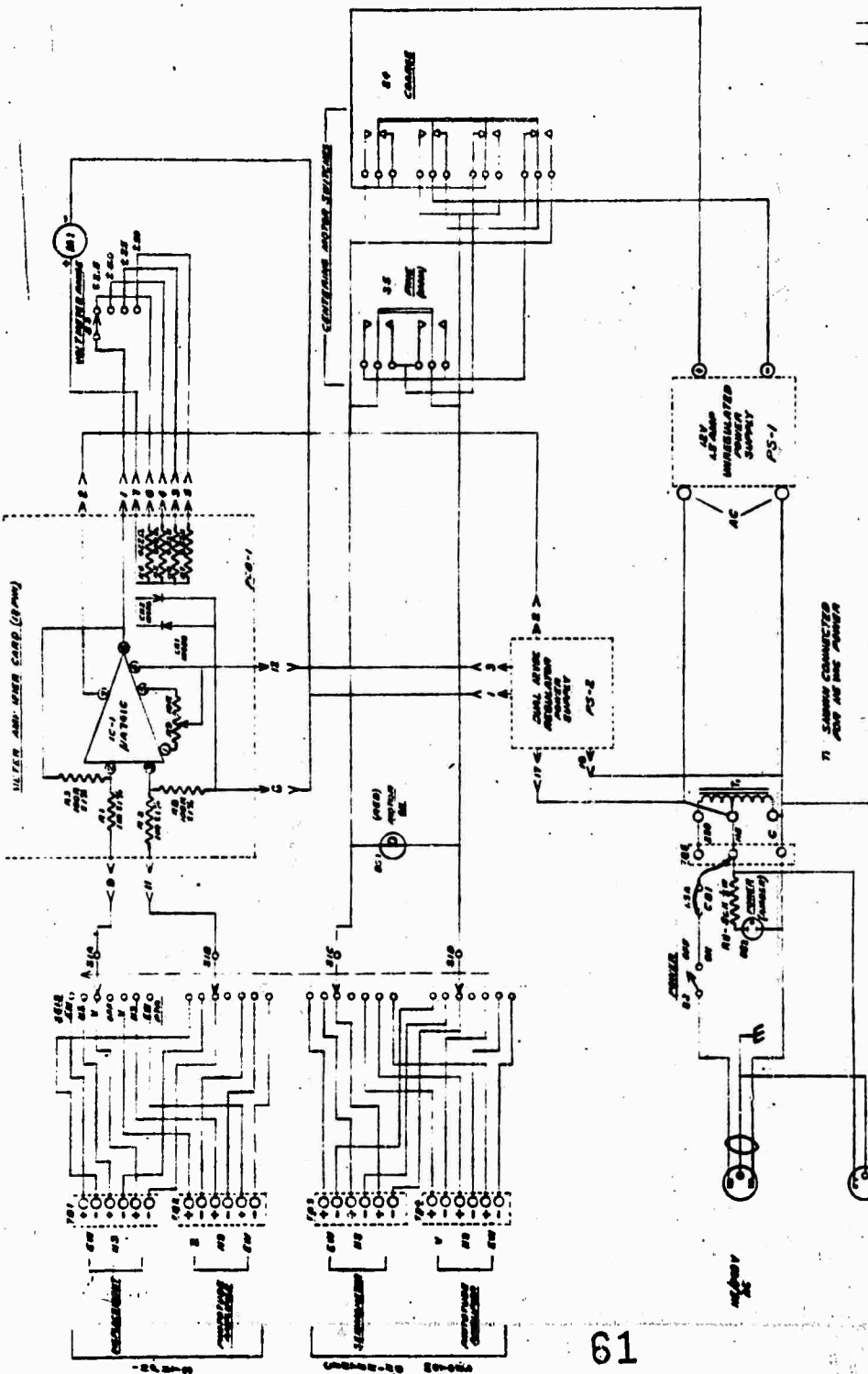


LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

VOLTMETER PANEL

| | |
|----------------------------|--------|
| TOLERANCES: | |
| UNLESS OTHERWISE SPECIFIED | |
| DIMENSIONS ARE IN INCHES | |
| DECIMAL | ANGLES |
| .125 ± | ± |
| .062 ± | ± |
| .031 ± | ± |
| .015 ± | ± |
| BREAM SHARP EDGES | |

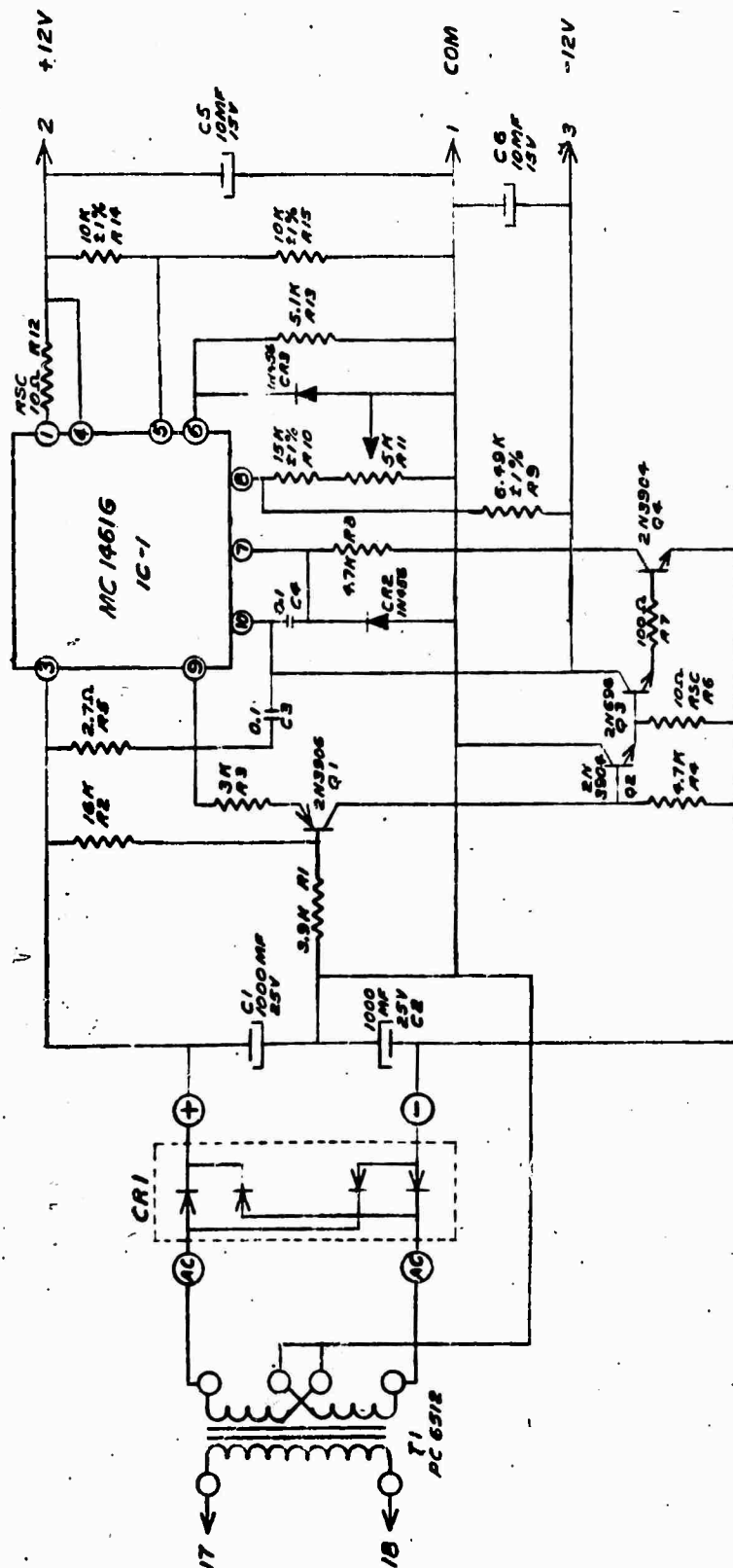
| | | | | | | | |
|----------|------|--------|--|-------|---|----|---|
| SCALE | 2/1 | WEIGHT | | SHEET | 1 | OF | 1 |
| FIG. NO. | 3213 | REV. | | | | | |



61

| | |
|------------------------------------|------------|
| OCEAN & ATMOSPHERIC SCIENCES, INC. | |
| SCHEMATIC | |
| BOOM POSITION/DISPLAY PANEL | |
| NO. 70726 | 1000-0-001 |

3220-1



62

OCEAN & ATMOSPHERIC SCIENCE, INC.
131 TOWN STREET
JAN 1966

SCHEMATIC POWER SUPPLY (DUAL REGULATED)

4.4.6.16

4-7
30

JOB

1007-B-001

3220-2

OCEAN & ATMOSPHERIC SCIENCE, INC.

145 PALISADE STREET

DOBBS FERRY, NEW YORK 10522

Dwg. #1008-D-001

PARTS LIST FOR PCB-1

| <u>Symbol</u> | <u>Description</u> | <u>Mfr. Number</u> |
|---|--|--------------------|
| CR 1 | Diode, silicon | LN 456 |
| CR 2 | same as CR 1 | |
| IC 1 | Integrated Circuit | NA 741 C |
| All fixed resistors are metal film type, RN60D, $\pm 1\%$ | | |
| R 1 | 1 megohm | |
| R 2 | same as R 1 | |
| R 3 | 100 K ohms | |
| R 4 | 422 ohms | |
| R 5 | 909 ohms | |
| R 6 | 4.53 K ohms | |
| R 7 | 9.53 K ohms | |
| R 8 | same as R 3 | |
| R 9 | Resistor, adjustable, Cermet type 10 K ohms | Bourns 3069P-1-103 |

PARTS LIST FOR PS-2

| | | |
|-----|---|------------------|
| C 1 | Capacitor, Electrolytic, 1000 MFD @ 25 VDC | Sirague TL-1218 |
| C 2 | same as C 1 | |
| C 3 | Capacitor, Ceramic, .1 MFD at 50 VDC | Centralab CK-104 |
| C 4 | same as C 3 | |

NOT REPRODUCIBLE

Dwg. #1008-D-001

BOOM POSITION DISPLAY PANEL

| <u>Symbol</u> | <u>Description</u> | <u>Mfg. Number</u> |
|---------------|--|---|
| CB 1 | Circuit Breaker, 1.5 A | Mallory CBB-150 |
| DS 1 | Bulb, incandescent, Miniature bayonet 14.4 Volts at 100 milliamperes | GE #1892 |
| DS 2 | Bulb, neon type, Miniature bayonet, without resistor | GE NE-51 |
| M 1 | Meter, Panel type, zero center, 500-0-500 microamperes, with special scale 2.5-0-2.5 & 5-0-5. Scale Accuracy 2%, Taut band construction | Honeywell Type M S 3T |
| PCB 1 | Meter Amplifier Card - see separate parts list | |
| PS-1 | Power Supply, modular, 12 VDC @ 1.5 amperes output regulated. | Ferrotran Model SU-12A |
| PS-2 | Power Supply, Plug-In, dual regulated, tracking -12 VDC @ 100 MA and -12 VDC @ 100 MA. See Separate Parts List. | CAS Type Mod 12-0.1 Dwg. #1007-B-001 |
| R 11 | Resistor, Composition, 1/2 watt, 56K ohms, $\pm 10\%$. | |
| S 1 | Switch, Rotary, 4 poles, 7 position non-shorting type contacts. | OTS #T235 |
| S 2 | Switch, toggle, 1 PST | C-E |
| S 3 | Switch, Rotary, 1 pole, 4 position non-shorting contacts | OTS #T205 |
| S 4 | Switch, lever type, 4 poles, 3 position latching, 3 amp contacts | Switchcraft #193121 |
| S 5 | Switch, lever type, 2 poles, 3 position non-locking, center off, 3 amp contacts | Switchcraft #19307 |
| T 1 | Transformer, Autotransformer voltage changing, 115/230 VAC @ 60 cycles. 100 VA rating. | Signal #811-100 |

NOT REPRODUCIBLE

OCEAN & ATMOSPHERIC SCIENCE, INC.
145 PALISADE STREET DOBBS FERRY, NEW YORK 10522

Dwg. #1008-D-001

BOOM POSITION DISPLAY PANEL (cont)

| <u>Symbol</u> | <u>Description</u> | <u>Mfg. Number</u> |
|---------------|---|--------------------|
| TB 1 | Terminal board, Barrier type, screw connection, 6 terminals | Cinch-Jones #6-140 |
| TB 2 | same as TB 1 | |
| TB 3 | same as TB 1 | |
| TB 4 | same as TB 1 | |
| TB 5 | Terminal board, Barrier type, screw connection, 3 terminals | Cinch-Jones #3-140 |

Dwg. #1007-B-001

PARTS LIST FOR PS-2 (cont.)

| <u>Symbol</u> | <u>Description</u> | <u>Mfg. Number</u> |
|---------------|--|------------------------------------|
| C 5 | Capacitor, tantalum, 10 MFD @ 15 VDC | Sprague 1961106X0015EB |
| C 6 | same as C 5 | |
| CR 1 | Rectifier Bridge, 1 amp @ 100 V RMS | International Rectifier #10BD1P |
| CR 2 | Diode, silicon | 1N 456 |
| CR 3 | same as CR 2 | |
| IC 1 | Integrated Circuit module | Motorola MC1461G |
| Q 1 | Transistor, PNP, silicon | Motorola 2N 3906 |
| Q 2 | Transistor, NPN, silicon | Motorola 2N 3904 |
| Q 3 | Transistor, NPN, silicon | Motorola 2N 696 |
| Q 4 | same as Q 2 | |
| R 1 | Resistor, fixed composition, 1/4 w, 1 1/2, 3.9 K | |
| R 2 | Ditto - 16 K | |
| R 3 | Ditto - 3 K | |
| R 4 | Ditto - 4.7 K | |
| R 5 | Ditto - 2.7 ohms | |
| R 6 | Resistor, fixed wirewound, 1/2 w, 1 1/2, 10 ohms | |
| R 7 | Resistor, fixed composition, 1/2 w, 1 1/2, 100 ohms | |
| R 8 | same as R 4 | |

OCEAN & ATMOSPHERIC SCIENCE, INC.

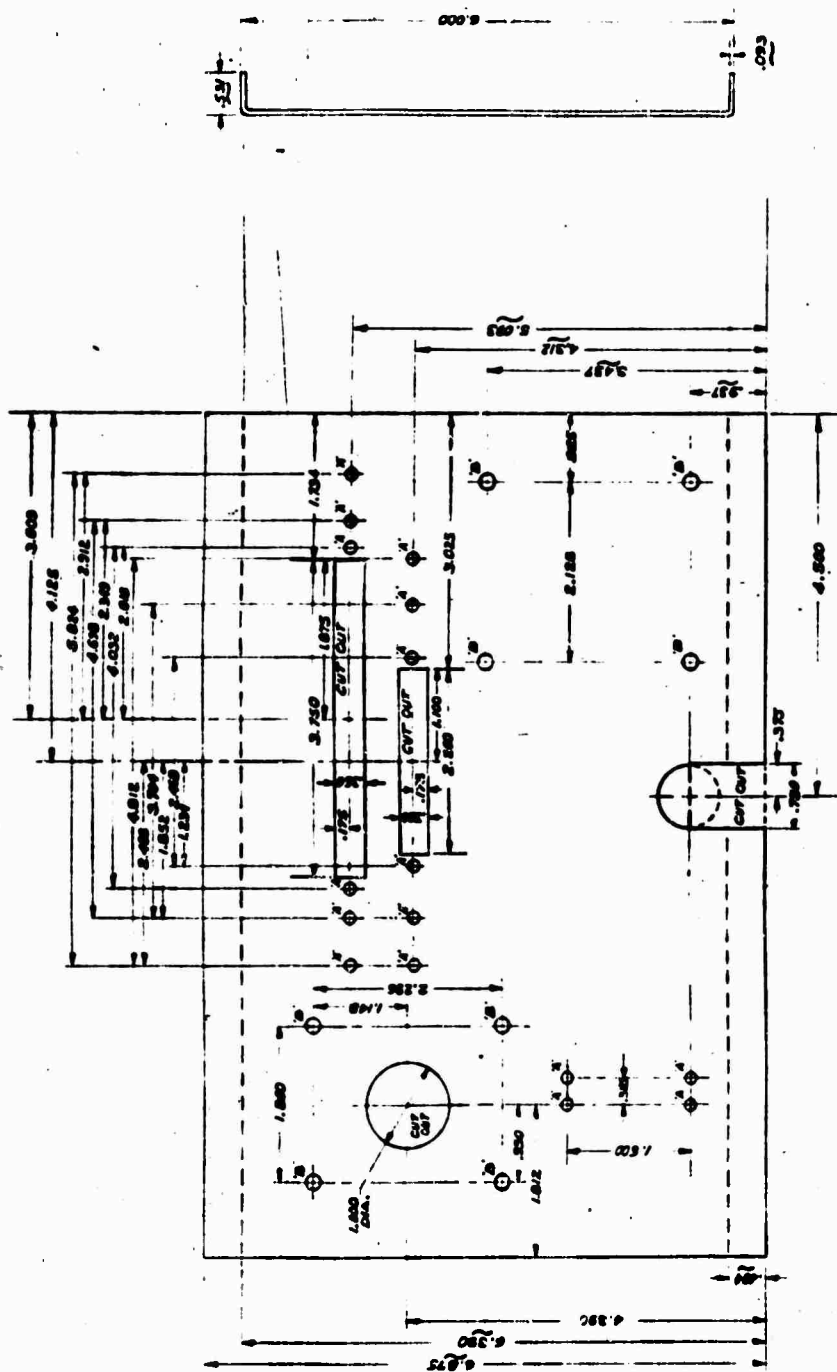
145 PALISADE STREET

DOBBS FERRY, NEW YORK 10522

Dwg. #1007-B-001

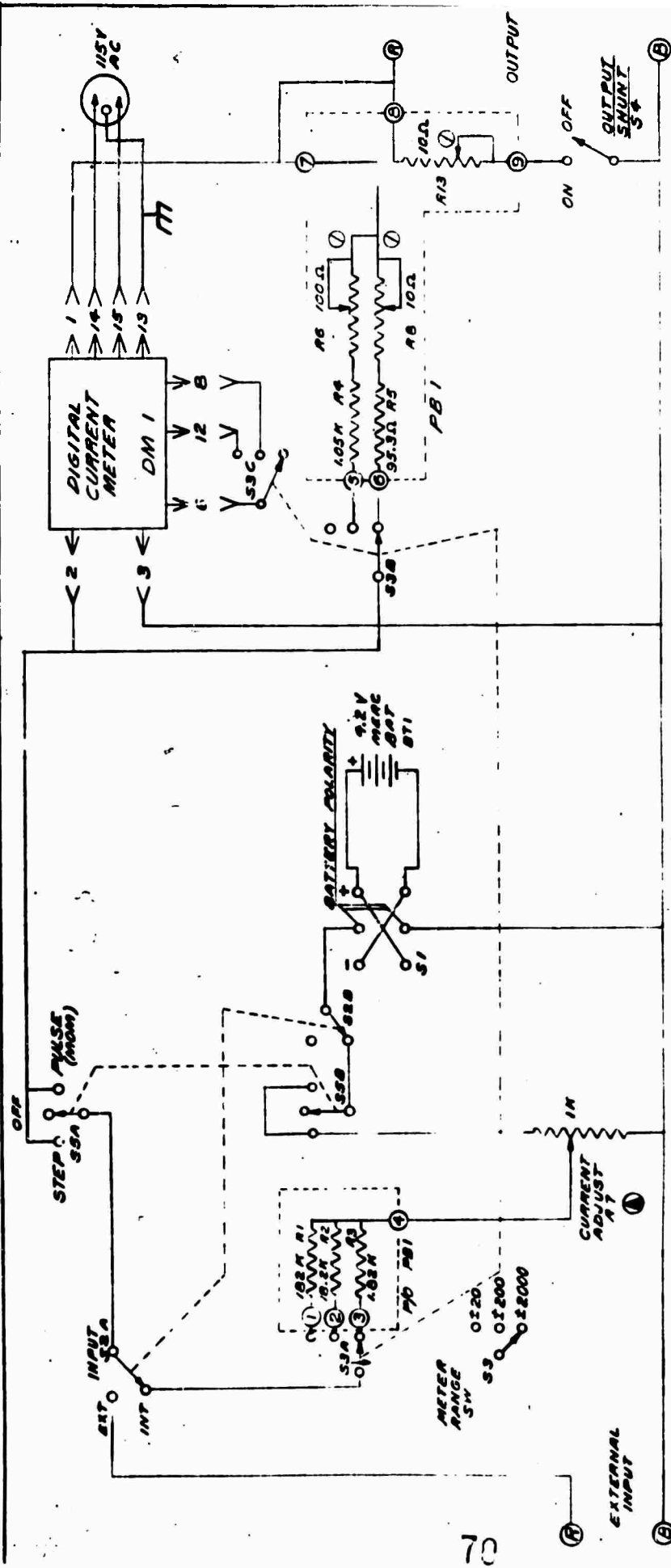
PARTS LIST FOR PS-2 (cont)

| <u>Symbol</u> | <u>Description</u> | <u>Mfg. Number</u> |
|---------------|---|--------------------|
| R 9 | Resistor, fixed metal film, RN60D, ± 1%, 6.49 K | |
| R 10 | Ditto - 15.0 K | |
| R 11 | Resistor, adjustable, Cermet type 5000 ohms | Bourns 3069P-1-E02 |
| R 12 | Resistor, fixed wirewound, $\frac{1}{2}$ W, ± 1%, 10 ohms | |
| R 13 | Resistor, fixed composition, $\frac{1}{2}$ W, ± 10%, 5.1 K | |
| R 14 | Resistor, fixed metal film, RN60D, ± 1%, 10 K ohms | |
| R 15 | same as R 14 | |

[illegible]

70-026

3220-4



OCEAN & ATMOSPHERIC SCIENCE INC.

SCHEMATIC CALIBRATION PANEL

70-026

1000-B-002

3230-1

OCEAN & ATMOSPHERIC SCIENCE, INC.

145 PALISADE STREET

DOBBS FERRY, NEW YORK 10522

Dwg. #1008-B-002

CALIBRATION PANEL

| <u>Symbol</u> | <u>Description</u> | <u>Mfg. Number</u> |
|---------------|---|------------------------------|
| BT 1 | Mercury Battery 4.2 VDC | Mallory #TR-133 |
| DM 1 | Digital Panel Meter, Bipolar, 19.99 microamperes full scale | Newport 210-2, Option E 2 |
| R 1 | Resistor, fixed, metal film type, RN60D, 182 K, $\pm 1\%$ ohms | |
| R 2 | Ditto R 1 - 18.2 K | |
| R 3 | Ditto R 1 - 1.82 K | |
| R 4 | Ditto R 1 - 1.05 K | |
| R 5 | Ditto R 1 - 95.3 K | |
| R 6 | Resistor, adjustable, Cermet type, 100 ohms | Bourns 3069-P-1-101 |
| R 7 | Potentiometer, Precision, conductive plastic type, 10 turns, bushing mount, 1000 ohms | Bourns 3051-S-1-102 |
| R 8 | Resistor, adjustable, Cermet type, 10 ohms | Bourns 3069-P-1-100 |
| R 9 | Not used | |
| R 10 | Not used | |
| R 11 | Not used | |
| R 12 | Not used | |
| R 13 | same as R 8 | |

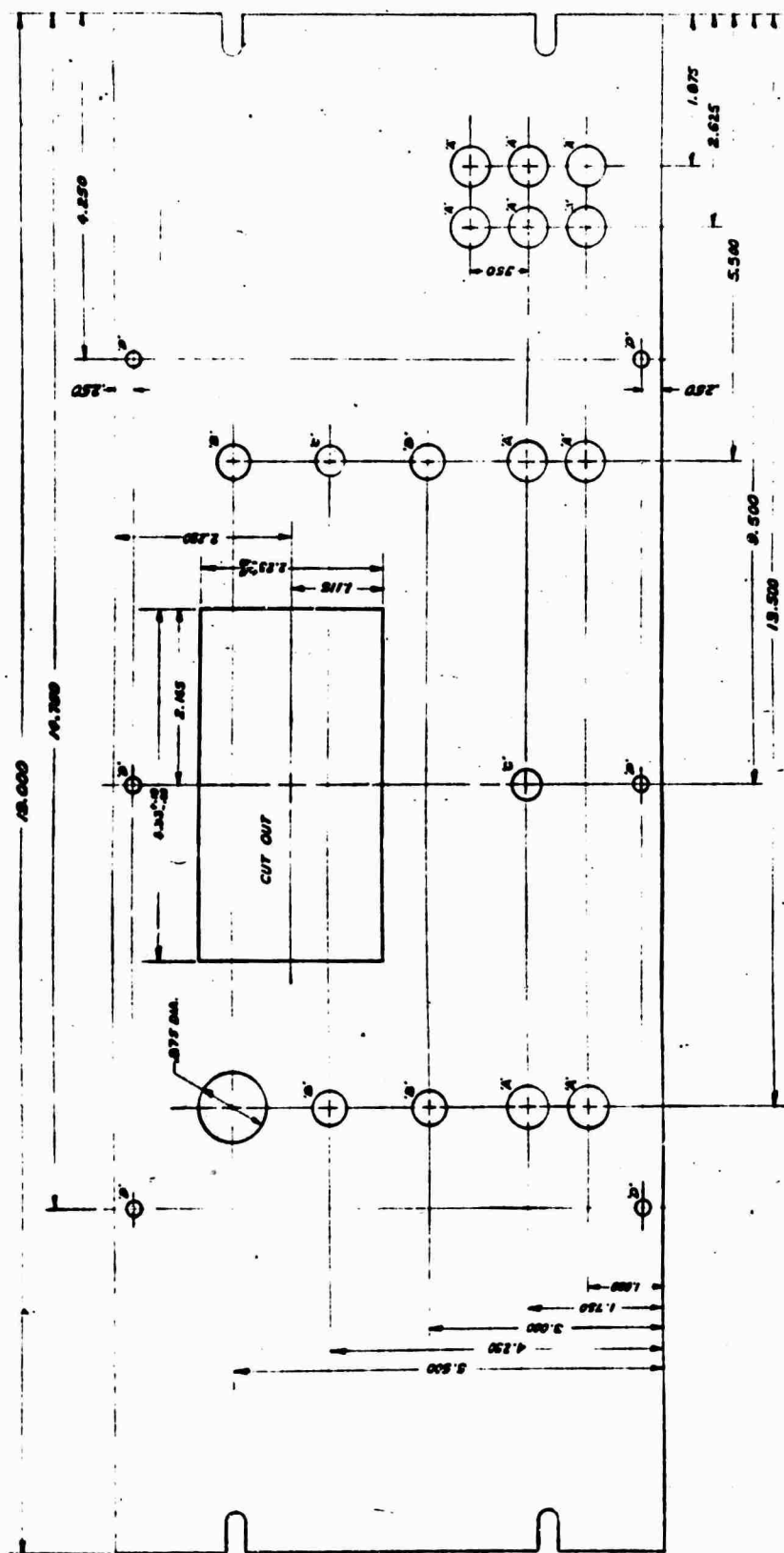
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Dwg. #1008-B-002

CALIBRATION PANEL (cont.)

| <u>Symbol</u> | <u>Description</u> | <u>Mfg. Number</u> |
|---------------|--|-----------------------|
| S 1 | Switch, Toggle, DPDT | Cutter-Hammer #837612 |
| S 2 | same as S 1 | |
| S 3 | Switch, Potary type, 3 poles, 3 position, non-shorting contacts | ITS #1207 |
| S 4 | Switch, toggle, DPST | Cutter-Hammer #837612 |
| S 5 | Switch, toggle, DPDT, center off, one side momentary | Cutter-Hammer #883313 |

NOT REPRODUCIBLE

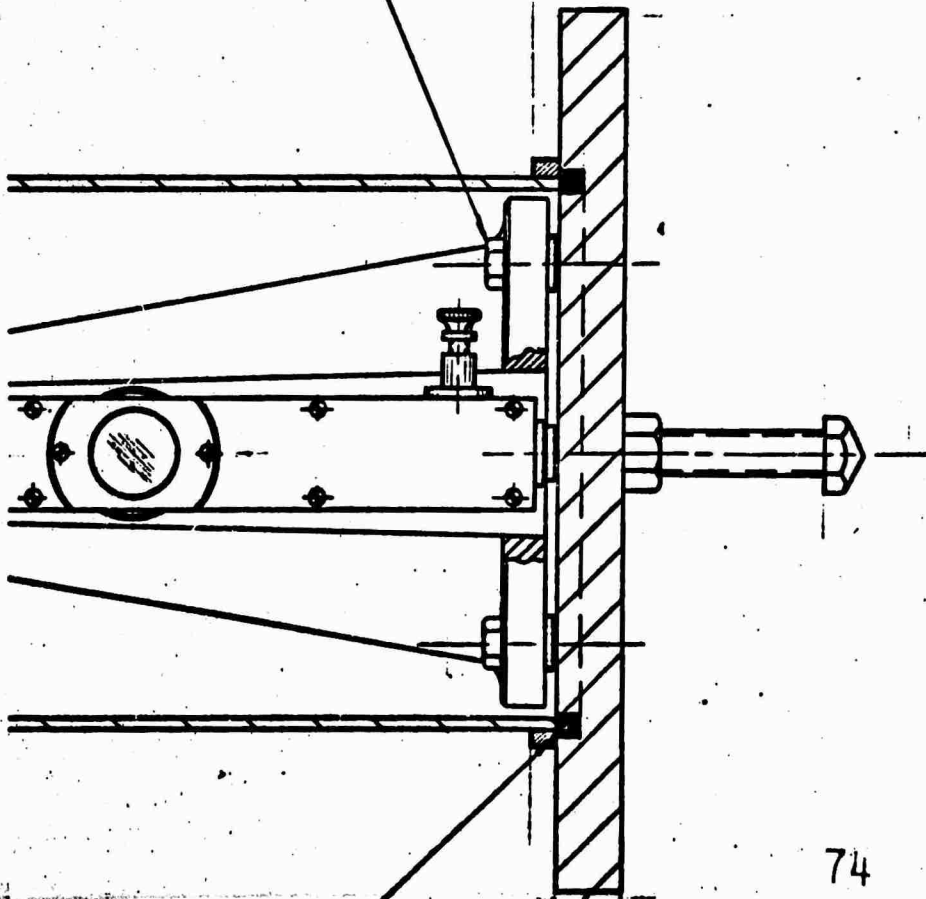


LEGEND

- A - (1.500) DIA. DR. - 10 HOLES
- B - (1.400) DIA. DR. - 4 HOLES
- C - (1.375) DIA. DR. - 2 HOLES
- D - (1.150) DIA. DR. - 6 HOLES

| | | | | |
|-------------------|---|----------|--|------|
| DESIGN NO. | DESCRIPTION | MATERIAL | DWG. NO. | REV. |
| | OCEAN & ATMOSPHERIC SCIENCE, INC. 131 EME STREET BLANVELT, NEW YORK 10012 | | | |
| TITLE | | | | |
| CALIBRATION PANEL | | | | |
| DATE | SCALE | FIGS. | TOLERANCES, UNLESS OTHERWISE NOTED. | |
| | | | FRACTIONAL 1/32 DECIMALS 1/16 ANGULAR 1/2° | |
| BY | CHKD | APP'D | CONTRACT NO. | |
| A. CLARKE | | | 70-026 | |
| REV. 10/1/66 | | | DRAWING NO. | |
| | | | 4008-C-005 | |

3230-2



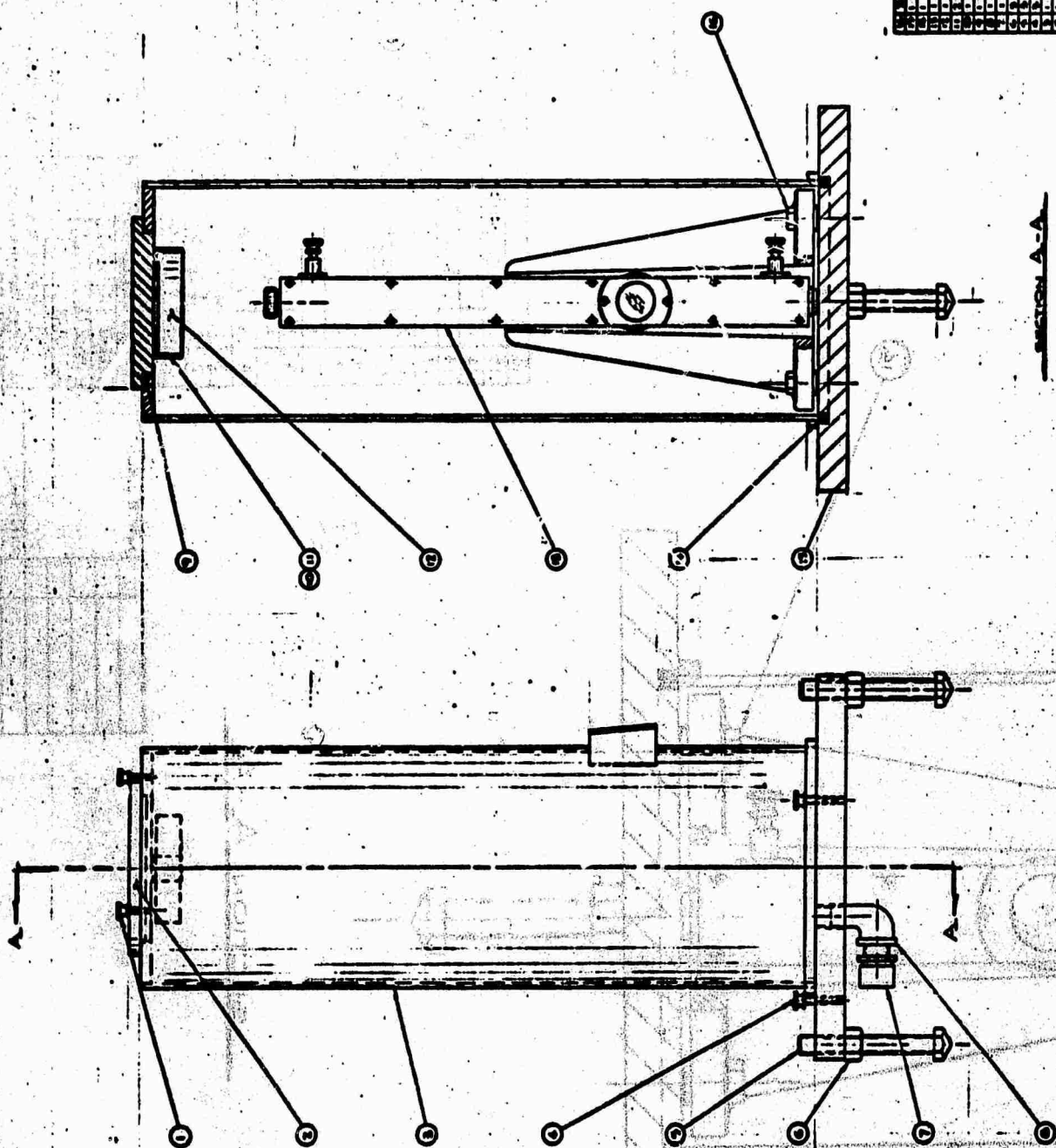
SECTION A-A

| ITEM NO. | DESCRIPTION | REMARKS |
|----------------------------|-------------------------------------|-------------|
| 16 | BOLT, HEX HD, 3/12 x 1.00 LG | |
| 15 | 1 4200-15 PLATE, BASE | |
| 14 | 1 0 RING 5.90 I.D. | PARKER |
| 13 | 1 LG-1 GALVANOMETER | KINEMATICS |
| 12 | 1 DRYER, AIR | DAVISON |
| 11 | 2 SCR, PAN HD 10-32 x .25 | |
| 10 | 1 4200-10 BRACKET, DRYING AGENT | |
| 9 | 1 0 RING 3.75 I.D. | PARKER |
| 8 | 1 ELBO, ADAPTER 3/8 MALE x 1/8 FEM. | CONKLIN |
| 7 | 1 CONNECTOR, INSULATED | RALCO |
| 6 | 3 NUT, HEX .500-20 | |
| 5 | 3 4300-5 LEG, LEVELING | |
| 4 | 3 2368 SCR, THUMB | M.H. SMITH |
| 3 | 1 4200-3 ENCLOSURE, CYLINDRICAL | |
| 2 | 1 4300-2 COVER, TOP | |
| 1 | 3 2366 SCR, THUMB | M.H. SMITH |
| DET/STY | PART NO | DESCRIPTION |
| CONTRACT | AF44-10-C-008 | |
| DRAWN | H. COSTA | 7/7/70 |
| CHECK | M. KLINGMAN | 7/14/70 |
| DESIGNED | | |
| TOLERANCES | | |
| UNLESS OTHERWISE SPECIFIED | | |
| ORIGINAL ANGLES | | |

| MATERIAL: | FINISH: |
|-----------|---------|
| | |
| | |
| | |
| | |
| | |

LAMONT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY

ASSEMBLY
LONG PERIOD GALVANOMETER

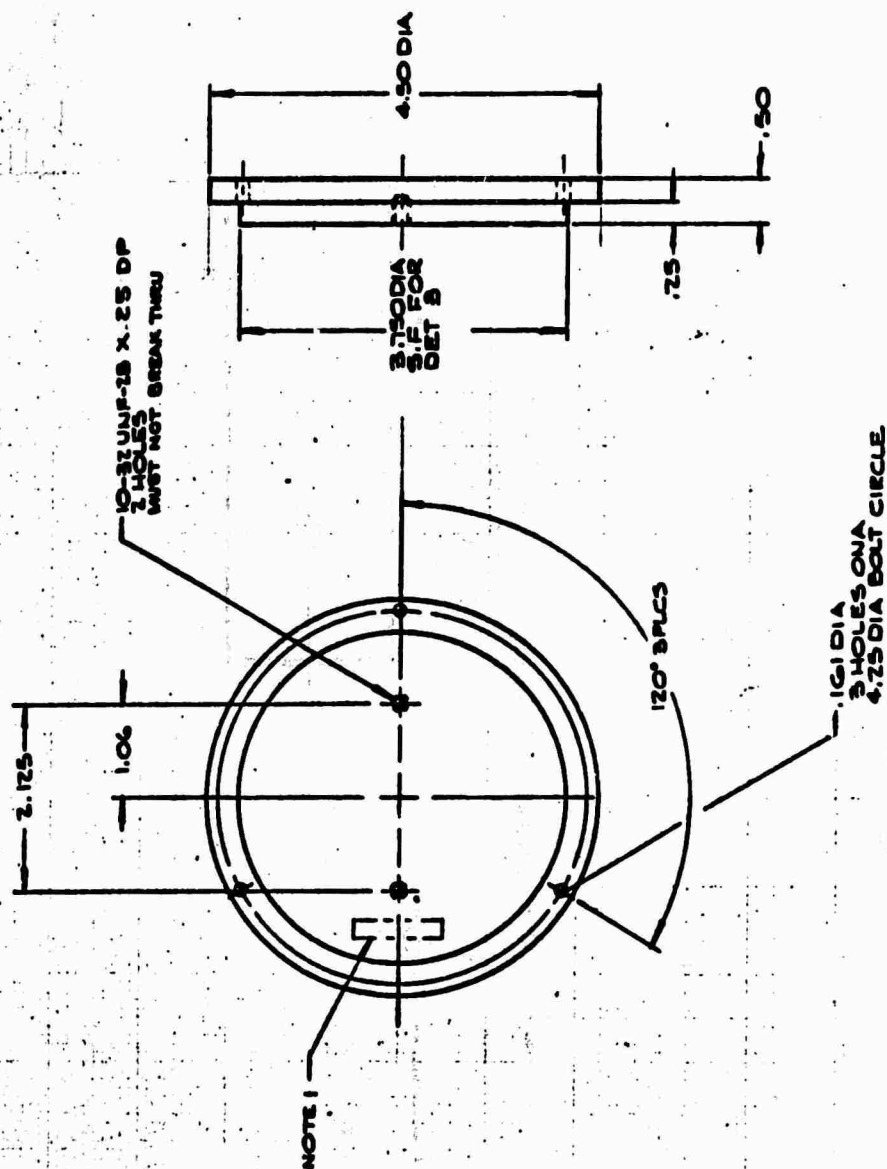


| ITEM NO. | DESCRIPTION | QUANTITY | UNIT | REMARKS |
|----------|-------------|----------|------|---------|
| 1 | BARREL | 1 | EA | |
| 2 | WHEEL | 1 | EA | |
| 3 | WHEEL | 1 | EA | |
| 4 | WHEEL | 1 | EA | |
| 5 | WHEEL | 1 | EA | |
| 6 | WHEEL | 1 | EA | |
| 7 | WHEEL | 1 | EA | |
| 8 | WHEEL | 1 | EA | |
| 9 | WHEEL | 1 | EA | |
| 10 | WHEEL | 1 | EA | |
| 11 | WHEEL | 1 | EA | |
| 12 | WHEEL | 1 | EA | |
| 13 | WHEEL | 1 | EA | |
| 14 | WHEEL | 1 | EA | |
| 15 | WHEEL | 1 | EA | |
| 16 | WHEEL | 1 | EA | |
| 17 | WHEEL | 1 | EA | |
| 18 | WHEEL | 1 | EA | |
| 19 | WHEEL | 1 | EA | |
| 20 | WHEEL | 1 | EA | |
| 21 | WHEEL | 1 | EA | |
| 22 | WHEEL | 1 | EA | |
| 23 | WHEEL | 1 | EA | |
| 24 | WHEEL | 1 | EA | |
| 25 | WHEEL | 1 | EA | |
| 26 | WHEEL | 1 | EA | |
| 27 | WHEEL | 1 | EA | |
| 28 | WHEEL | 1 | EA | |
| 29 | WHEEL | 1 | EA | |
| 30 | WHEEL | 1 | EA | |
| 31 | WHEEL | 1 | EA | |
| 32 | WHEEL | 1 | EA | |
| 33 | WHEEL | 1 | EA | |
| 34 | WHEEL | 1 | EA | |
| 35 | WHEEL | 1 | EA | |
| 36 | WHEEL | 1 | EA | |
| 37 | WHEEL | 1 | EA | |
| 38 | WHEEL | 1 | EA | |
| 39 | WHEEL | 1 | EA | |
| 40 | WHEEL | 1 | EA | |
| 41 | WHEEL | 1 | EA | |
| 42 | WHEEL | 1 | EA | |
| 43 | WHEEL | 1 | EA | |
| 44 | WHEEL | 1 | EA | |
| 45 | WHEEL | 1 | EA | |
| 46 | WHEEL | 1 | EA | |
| 47 | WHEEL | 1 | EA | |
| 48 | WHEEL | 1 | EA | |
| 49 | WHEEL | 1 | EA | |
| 50 | WHEEL | 1 | EA | |
| 51 | WHEEL | 1 | EA | |
| 52 | WHEEL | 1 | EA | |
| 53 | WHEEL | 1 | EA | |
| 54 | WHEEL | 1 | EA | |
| 55 | WHEEL | 1 | EA | |
| 56 | WHEEL | 1 | EA | |
| 57 | WHEEL | 1 | EA | |
| 58 | WHEEL | 1 | EA | |
| 59 | WHEEL | 1 | EA | |
| 60 | WHEEL | 1 | EA | |
| 61 | WHEEL | 1 | EA | |
| 62 | WHEEL | 1 | EA | |
| 63 | WHEEL | 1 | EA | |
| 64 | WHEEL | 1 | EA | |
| 65 | WHEEL | 1 | EA | |
| 66 | WHEEL | 1 | EA | |
| 67 | WHEEL | 1 | EA | |
| 68 | WHEEL | 1 | EA | |
| 69 | WHEEL | 1 | EA | |
| 70 | WHEEL | 1 | EA | |
| 71 | WHEEL | 1 | EA | |
| 72 | WHEEL | 1 | EA | |
| 73 | WHEEL | 1 | EA | |
| 74 | WHEEL | 1 | EA | |
| 75 | WHEEL | 1 | EA | |
| 76 | WHEEL | 1 | EA | |
| 77 | WHEEL | 1 | EA | |
| 78 | WHEEL | 1 | EA | |
| 79 | WHEEL | 1 | EA | |
| 80 | WHEEL | 1 | EA | |
| 81 | WHEEL | 1 | EA | |
| 82 | WHEEL | 1 | EA | |
| 83 | WHEEL | 1 | EA | |
| 84 | WHEEL | 1 | EA | |
| 85 | WHEEL | 1 | EA | |
| 86 | WHEEL | 1 | EA | |
| 87 | WHEEL | 1 | EA | |
| 88 | WHEEL | 1 | EA | |
| 89 | WHEEL | 1 | EA | |
| 90 | WHEEL | 1 | EA | |
| 91 | WHEEL | 1 | EA | |
| 92 | WHEEL | 1 | EA | |
| 93 | WHEEL | 1 | EA | |
| 94 | WHEEL | 1 | EA | |
| 95 | WHEEL | 1 | EA | |
| 96 | WHEEL | 1 | EA | |
| 97 | WHEEL | 1 | EA | |
| 98 | WHEEL | 1 | EA | |
| 99 | WHEEL | 1 | EA | |
| 100 | WHEEL | 1 | EA | |

SECTION A-A

NOTES

1. STAMP OR STENCIL PART WHERE INDICATED
2. 12% SURFACE FINISH ALL OVER EXCEPT WHERE NOTED



**LAHOIT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY**

COVER, TOP -
LONG PERIOD GALVANOMETER

SCALE 1/1

USA

[illegible]



NOTES: 1 STAMP OR STENCIL PART NO
WHERE INDICATED.
2 FOR SURFACE FINISH ALL OVER
EXCEPT WHERE NOTED

DSO



100

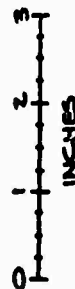
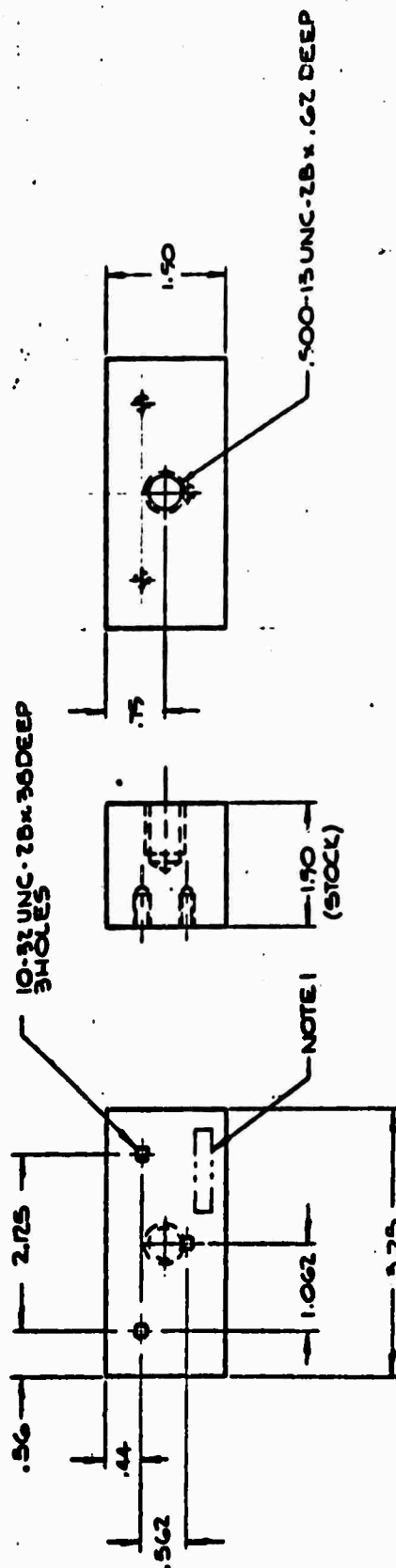
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| LETTER | REVISIONS | DATE | APPROVED |
|--------|-----------|------|----------|
| | | | |

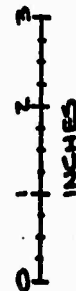
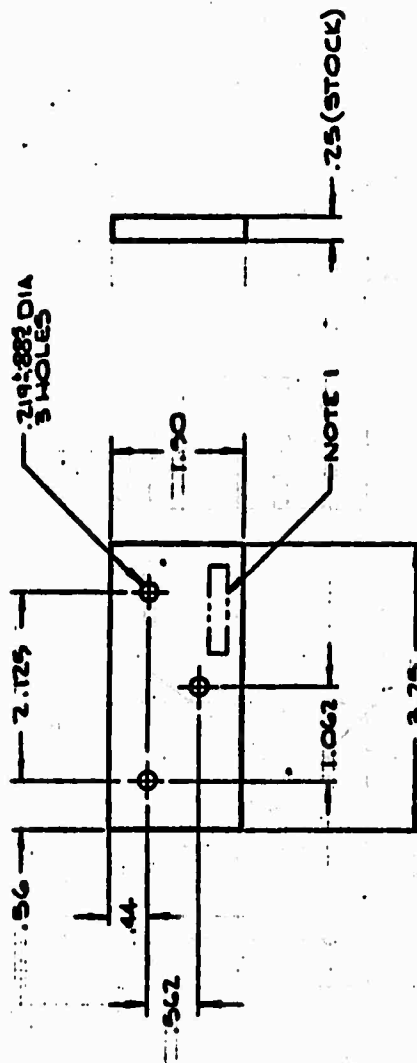
NOTES:
 1 STAMP OR STENCIL PART NO. WHERE INDICATED
 2 $\frac{1}{32}$ SURFACE FINISH ALL OVER EXCEPT WHERE NOTED.



| | |
|--------------------------|--|
| CONTRACT | AF 4430-70-C-0038 |
| DRAWN BY | W. J. STALLS |
| CHECK BY | W. J. STALLS |
| DATE | 7/1/70 |
| PROJECT | ENGINEERING |
| MATERIALS | BRASS 1/2 HARD |
| FINISH | CHROMIC ACID DIP. |
| QUANTITY | 4300 |
| NEXT ASM | QTY |
| TOLERANCES | UNLESS OTHERWISE SPECIFIED |
| DIMENSIONS ARE IN INCHES | |
| DECIMAL | 1 1/16 1/8 1/4 3/8 1/2 5/8 3/4 7/8 1 1 1/4 1 1/2 1 3/4 2 2 1/4 2 1/2 3 3 1/4 3 1/2 4 4 1/4 4 1/2 5 5 1/4 5 1/2 6 6 1/4 6 1/2 7 7 1/4 7 1/2 8 8 1/4 8 1/2 9 9 1/4 9 1/2 10 10 1/4 10 1/2 11 11 1/4 11 1/2 12 12 1/4 12 1/2 13 13 1/4 13 1/2 14 14 1/4 14 1/2 15 15 1/4 15 1/2 16 16 1/4 16 1/2 17 17 1/4 17 1/2 18 18 1/4 18 1/2 19 19 1/4 19 1/2 20 20 1/4 20 1/2 21 21 1/4 21 1/2 22 22 1/4 22 1/2 23 23 1/4 23 1/2 24 24 1/4 24 1/2 25 25 1/4 25 1/2 26 26 1/4 26 1/2 27 27 1/4 27 1/2 28 28 1/4 28 1/2 29 29 1/4 29 1/2 30 30 1/4 30 1/2 31 31 1/4 31 1/2 32 32 1/4 32 1/2 33 33 1/4 33 1/2 34 34 1/4 34 1/2 35 35 1/4 35 1/2 36 36 1/4 36 1/2 37 37 1/4 37 1/2 38 38 1/4 38 1/2 39 39 1/4 39 1/2 40 40 1/4 40 1/2 41 41 1/4 41 1/2 42 42 1/4 42 1/2 43 43 1/4 43 1/2 44 44 1/4 44 1/2 45 45 1/4 45 1/2 46 46 1/4 46 1/2 47 47 1/4 47 1/2 48 48 1/4 48 1/2 49 49 1/4 49 1/2 50 50 1/4 50 1/2 51 51 1/4 51 1/2 52 52 1/4 52 1/2 53 53 1/4 53 1/2 54 54 1/4 54 1/2 55 55 1/4 55 1/2 56 56 1/4 56 1/2 57 57 1/4 57 1/2 58 58 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164 1/2 165 165 1/4 165 1/2 166 166 1/4 166 1/2 167 167 1/4 167 1/2 168 168 1/4 168 1/2 169 169 1/4 169 1/2 170 170 1/4 170 1/2 171 171 1/4 171 1/2 172 172 1/4 172 1/2 173 173 1/4 173 1/2 174 174 1/4 174 1/2 175 175 1/4 175 1/2 176 176 1/4 176 1/2 177 177 1/4 177 1/2 178 178 1/4 178 1/2 179 179 1/4 179 1/2 180 180 1/4 180 1/2 181 181 1/4 181 1/2 182 182 1/4 182 1/2 183 183 1/4 183 1/2 184 184 1/4 184 1/2 185 185 1/4 185 1/2 186 186 1/4 186 1/2 187 187 1/4 187 1/2 188 188 1/4 188 1/2 189 189 1/4 189 1/2 190 190 1/4 190 1/2 191 191 1/4 191 1/2 192 192 1/4 192 1/2 193 193 1/4 193 1/2 194 194 1/4 194 1/2 195 195 1/4 195 1/2 196 196 1/4 196 1/2 197 197 1/4 197 1/2 198 198 1/4 198 1/2 199 199 1/4 199 1/2 200 200 1/4 200 1/2 201 201 1/4 201 1/2 202 202 1/4 202 1/2 203 203 1/4 203 1/2 204 204 1/4 204 1/2 205 205 1/4 205 1/2 206 206 1/4 206 1/2 207 207 1/4 207 1/2 208 208 1/4 208 1/2 209 209 1/4 209 1/2 210 210 1/4 210 1/2 211 211 1/4 211 1/2 212 212 1/4 212 1/2 213 213 1/4 213 1/2 214 214 1/4 214 1/2 215 215 1/4 215 1/2 216 216 1/4 216 1/2 217 217 1/4 217 1/2 218 218 1/4 218 1/2 219 219 1/4 219 1/2 220 220 1/4 220 1/2 221 221 1/4 221 1/2 222 222 1/4 222 1/2 223 223 1/4 223 1/2 224 224 1/4 224 1/2 225 225 1/4 225 1/2 226 226 1/4 226 1/2 227 227 1/4 227 1/2 228 228 1/4 228 1/2 229 229 1/4 229 1/2 230 230 1/4 230 1/2 231 231 1/4 231 1/2 232 232 1/4 232 1/2 233 233 1/4 233 1/2 234 234 1/4 234 1/2 235 235 1/4 235 1/2 236 236 1/4 236 1/2 237 237 1/4 237 1/2 238 238 1/4 238 1/2 239 239 1/4 239 1/2 240 240 1/4 240 1/2 241 241 1/4 241 1/2 242 242 1/4 242 1/2 243 243 1/4 243 1/2 244 244 1/4 244 1/2 245 245 1/4 245 1/2 246 246 1/4 246 1/2 247 247 1/4 247 1/2 248 248 1/4 248 1/2 249 249 1/4 249 1/2 250 250 1/4 250 1/2 251 251 1/4 251 1/2 252 252 1/4 252 1/2 253 253 1/4 253 1/2 254 254 1/4 254 1/2 255 255 1/4 255 1/2 256 256 1/4 256 1/2 257 257 1/4 257 1/2 258 258 1/4 258 1/2 259 259 1/4 259 1/2 260 260 1/4 260 1/2 261 261 1/4 261 1/2 262 262 1/4 262 1/2 263 263 1/4 263 1/2 264 264 1/4 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314 1/2 315 315 1/4 315 1/2 316 316 1/4 316 1/2 317 317 1/4 317 1/2 318 318 1/4 318 1/2 319 319 1/4 319 1/2 320 320 1/4 320 1/2 321 321 1/4 321 1/2 322 322 1/4 322 1/2 323 323 1/4 323 1/2 324 324 1/4 324 1/2 325 325 1/4 325 1/2 326 326 1/4 326 1/2 327 327 1/4 327 1/2 328 328 1/4 328 1/2 329 329 1/4 329 1/2 330 330 1/4 330 1/2 331 331 1/4 331 1/2 332 332 1/4 332 1/2 333 333 1/4 333 1/2 334 334 1/4 334 1/2 335 335 1/4 335 1/2 336 336 1/4 336 1/2 337 337 1/4 337 1/2 338 338 1/4 338 1/2 339 339 1/4 339 1/2 340 340 1/4 340 1/2 341 341 1/4 341 1/2 342 342 1/4 342 1/2 343 343 1/4 343 1/2 344 344 1/4 344 1/2 345 345 1/4 345 1/2 346 346 1/4 346 1/2 347 347 1/4 347 1/2 348 348 1/4 348 1/2 349 349 1/4 349 1/2 350 350 1/4 350 1/2 351 351 1/4 351 1/2 352 352 1/4 352 1/2 353 353 1/4 353 1/2 354 354 1/4 354 1/2 355 355 1/4 355 1/2 356 356 1/4 356 1/2 357 357 1/4 357 1/2 358 358 1/4 358 1/2 359 359 1/4 359 1/2 360 360 1/4 360 1/2 361 361 1/4 361 1/2 362 362 1/4 362 1/2 363 363 1/4 363 1/2 364 364 1/4 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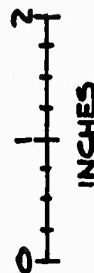
| LETTER | REVISION | DATE | APPROVED |
|--------|----------|------|----------|
| | | | |

NOTES:
 1 STAMP OR STENCIL PART NO. WHERE INDICATED.
 2 ~~178~~ SURFACE FINISH OVER EXCEPT WHERE NOTED.



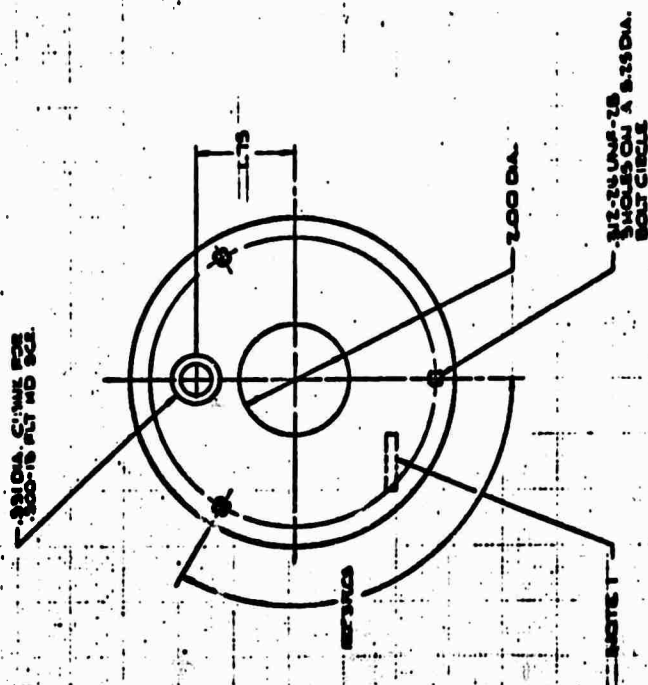
| | | | |
|---|--|--|--|
| LANMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY | | PLATE, CLAMPING - SHORT PERIOD GALVANOMETER | |
| CONTRACT 15-11130-70-C-0038 DRAWN BY H. COSTALUS/CT/170 CHECK BY H. K. LINDMAN/1/11/70 POOL ENGINE | | TOLERANCES: UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL ANGLES .125 ± .002 .100 ± .002 .062 ± .002 .031 ± .002 BREAK SHARP EDGES | |
| MATERIAL: BRASS 1/2 HARD | | FINISH: CHROMIC ACID DIP. | |
| 4300 NEXT ASM BY | | SHEET NO. 4300-3 SCALE 1/1 WEIGHT SHEET 1 OF 1 | |

ASD



450

NOTES: 1. STAMP OR STENCIL PART NO. WHERE LOCATED.
2. ☒ SURFACE FINISH ALL OVER EXCEPT WHERE NOTED

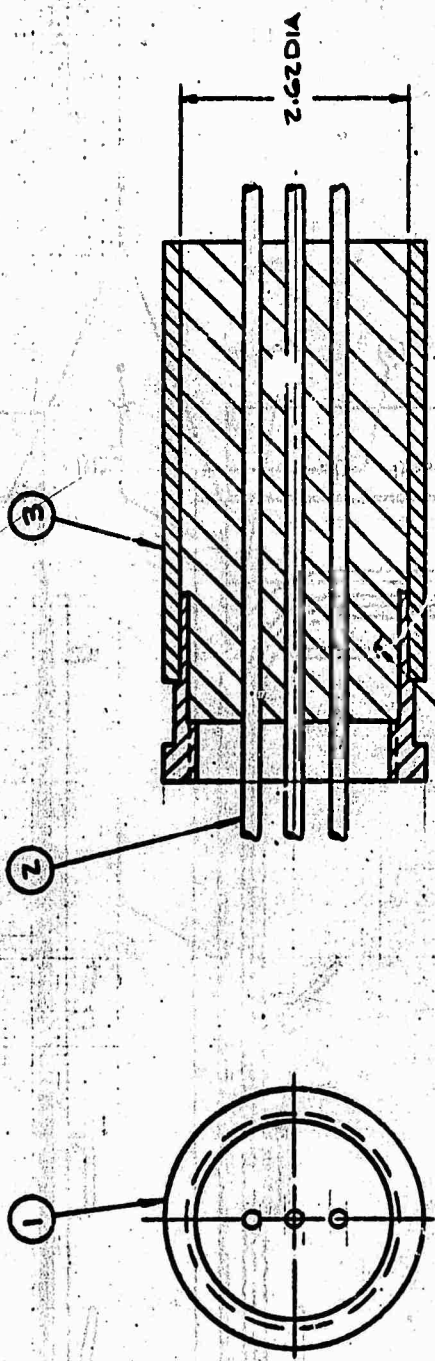


11

[illegible]

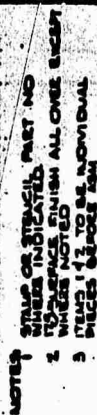
42

| REVISION | DATE | APPROVAL |
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| | | |



INCHES

| | | | |
|--|--|---|--|
| WIRE INSULATOR 2.62 DIA. NILES SHIELDS ADAPTEE MOD. | | DESIGN PART NO. 15110-10C-0038 CONTRACT H. COSMOS 7/7/70 CHECK BY M. KUNEMAN 7/13/70 PROJ. ENGR. | |
| MATERIAL | | FINISH | |
| TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMALS .125 ± .04 .250 ± .02 .500 ± .005 BREAK SHARP EDGES | | LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY | |
| ASSEMBLY, WIRE INSULATOR | | PART NO. 5102 SCALE 1/1 WEIGHT SHEET 1 OF 1 | |

[illegible]

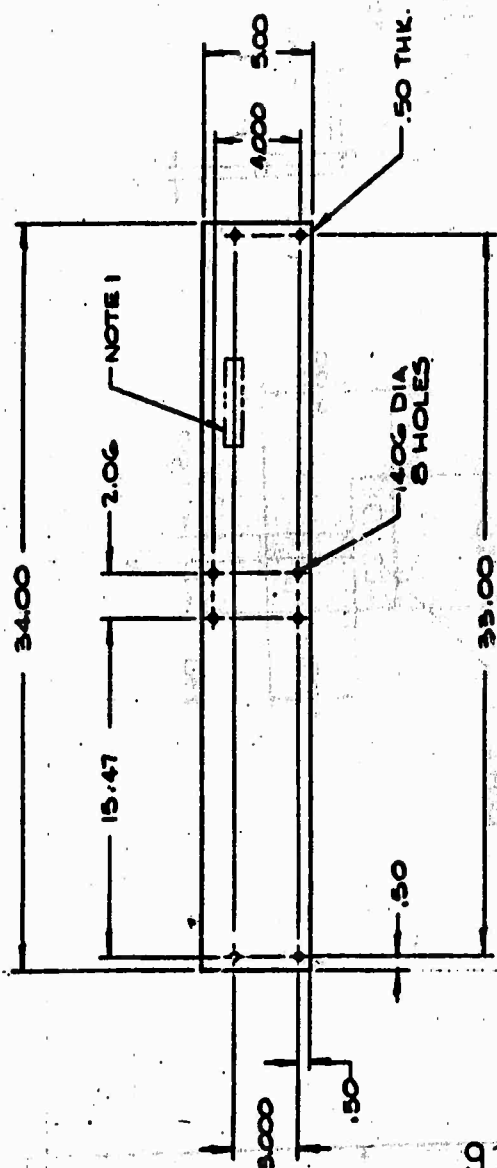
450



| | | |
|--|--|---------------|
| | | MATERIAL: |
| | | FINISH: |
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| | | |
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| | | NEXT ASSEMBLY |

| LETTER | DESCRIPTION | DATE | APPROVED |
|--------|-------------|------|----------|
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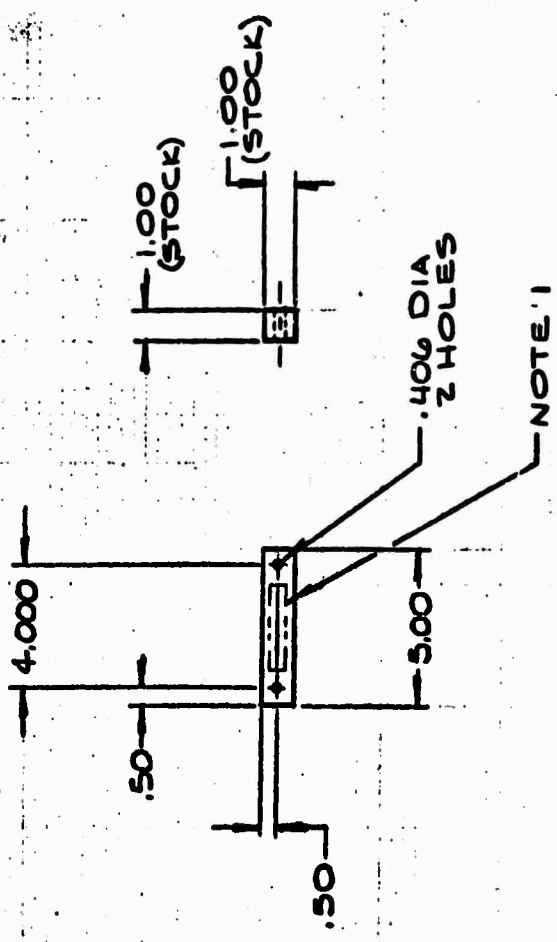
- NOTES
- 1 STAMP OR STENCIL PART NO WHERE INDICATED
 - 2 1/32" SURFACE FINISH ALL OVER EXCEPT WHERE NOTED



| | | | |
|--|----------------------------------|---|--------------------|
| | | LAMONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY | |
| PLATE - SEISMOMETER ENCLOSURE PRESTRESSER | | DATE NO. 8103-2 | |
| SCALE 1/4" | | WEIGHT 1 OF 1 | |
| CONTRACT IF 4420-70-C-0038 | DRAWN BY COSTALIS 7-23-70 | CHECK BY W. K. | DATE 8-2-70 |
| MATERIAL MILD STEEL | | FINISH | |
| TOLERANCES: UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ANGLES ± .015 ± .010 ± .005 | | BREAK SHARP EDGES | |
| 1103 | 2 | NEXT ASM. | QTY |

| LETTER | REVISIONS | DATE | APPROVED |
|--------|-----------|------|----------|
| | | | |

- NOTES
- 1 STAMP OR STENCIL PART NO WHERE INDICATED
 - 2 1/2" SURFACE FINISH ALL OVER EXCEPT WHERE NOTED



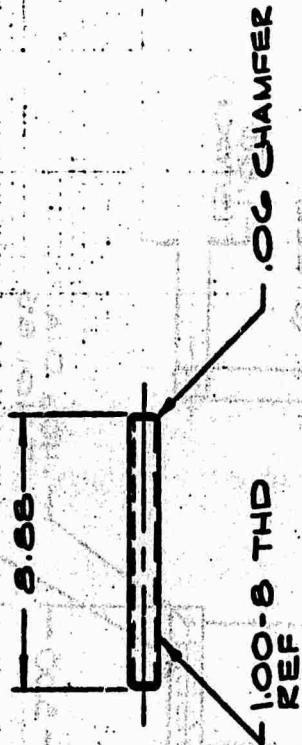
| | |
|--|-------------------|
| CONTRACT | AF4420-70-C-0028 |
| DRAWN BY | COSTAKIS T-74-70 |
| CHECK BY | W. K. 8-3-70 |
| APPROVED | |
| MATERIAL: | ALUMINUM 2024-T4 |
| FINISH | |
| TOLERANCES: UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL ANGLES | |
| | ± .01 |
| | ± .02 |
| | ± .005 |
| | BREAK SHARP EDGES |
| 1103 2 | |
| NEXT ASMTY | |

LAHOIT GEOLOGICAL OBSERVATORY
OF COLUMBIA UNIVERSITY


BLOCK, SPACER
SEISMOMETER ENCLOSURE
PRESTRESSER

DWG. NO. 8103-3
SCALE 1/4" = 1" WEIGHT 100
REV. 1

| LETTERS | DESCRIPTION | DATE | APPROVED |
|---------|-------------|------|----------|
|---------|-------------|------|----------|



0 1 2
INCHES

| | | | |
|--|----------------|---|--|
| CONTRACT NF-AU-70-30-C-0038 | | LAHONT GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY | |
| DRAWN BY | CO-57A31-78-70 |  | |
| CHECK BY | W.K. 8-3-70 | | |
| TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL FRACTIONS ANGLES | | ROD, THREADED - SEISMOMETER ENCLOSURE PRESTRESSOR | |
| 1.003 ± .005 NEXT ASQTY 1 | | DIMS NO. 8103-4 REV | |
| 1.003 ± .005 NEXT ASQTY 1 | | SCALE 1/4" = 1" WEIGHT SHEET OF | |